

► Fast Unloading for AT&SF Hoppers

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RAILWAY

LOCOMOTIVES AND CARS

A SIMMONS BOARDMAN TIME-SAVER PUBLICATION

OCTOBER 1961



Exhibits Show Rapid Pace Equipment Development

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Passenger Diesel Converted for Freight Service

... page 42





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power hand brake

The mechanical principle employed in this brake provides ample power with maximum safety and speed of application. Braking load is held at any position automatically and can be gradually or fully released with little effort by merely turning the wheel. This exclusive feature for holding the load at any point receives the enthusiastic endorsement of all brakemen. Quick release, WITHOUT ANY RECOIL OR BACKWARD SPIN of the hand wheel, is effected by pulling the full release handle. The brake is lubricated, and is entirely enclosed to give protection from the weather.

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OFFICE OF FOREIGN OPERATIONS

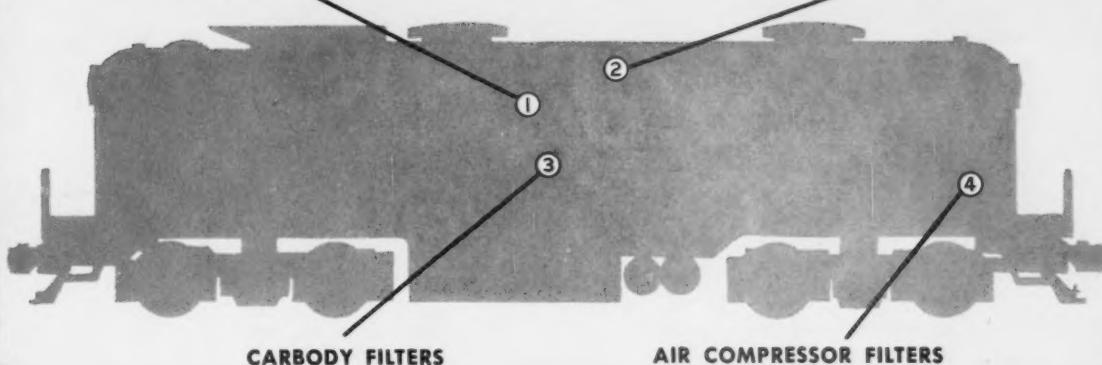
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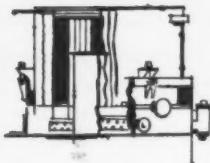


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Whether you or the manufacturer rebuilds your locomotives, be sure to specify and use Air-Maze filtration products. Thirty-five years of filtration experience assures the Railroad Industry of maximum performance.

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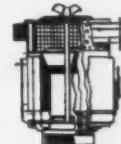
③ CARBODY FILTERS

Designed to filter effectively . . . rugged construction assures long life.



④ AIR COMPRESSOR FILTERS

Cut compressor wear . . . simple installation and servicing . . . available for all compressor models.



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ROCKWELL-STANDARD CORPORATION

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WIKIT*



journal lubricators

quality-engineered for lasting dependability

AAR CONDITIONALLY APPROVED

WIKIT Journal Lubricators are designed and manufactured by Callaway Products, Inc., with a single objective —to provide effective lubrication continuously under all operating and weather conditions. To this end, all materials

used in WIKIT lubricators are the highest quality, selected for long life, efficient wicking properties, and ease of renovation. Every WIKIT meets the high standards of Callaway Quality—proved by top performance records.

Economical to use because of WIKIT's moderate initial cost—easy, inexpensive renovation.

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WIKIT #11 retains 7 pints of oil after saturation and draining 3 hours. Cores are best quality neoprene foam—resistant to oil, moisture, heat, compression set. Strong nylon tape secures non-ferrous pull handle. Insert either end first, either side up!

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Modern plant where WIKITS are made



RAILWAY LOCO- MOTIVES AND CARS

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October, 1961—Vol. 135, No. 10

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REPORT FOR OCTOBER

Importance of Wedges Stressed by AAR

Supervisors and carmen removing and inspecting journal-bearing wedges do not always understand the functions which a wedge is to perform, two AAR Mechanical Division task forces reported recently following field investigations of wedges. Because some believe the wedge is only a filler block which facilitates application and removal of the bearing, the AAR wants all concerned with truck maintenance to know that wedges must have properly lubricated smooth top and bottom surfaces to provide for their free lateral movement. Without this free lateral, the journal bearing can become tightly wedged against either the collar end or the fillet end of the journal, causing undue end wear and overheating.

"Journal bearing wedges should receive proper care in handling, transit, and storage in a suitable manner similar to that outlined in the Lubrication Manual for journal bearings. Storage should preferably be indoors to prevent accelerated corrosion. Forged wedges become easily nicked when thrown or dropped in handling," the report stated.

Summaries of 479 wedges inspected by the AAR group showed 104—21.7%—condemnable. Their defects were:

Flat on top, lengthwise	92
Distorted	10
Over-all length	2

It was also found that many points did not have wedges in stock, while others did not have the supplies required by Interchange Rule 66. Practically all of the condemnable journal bearing wedges must be renewed in connection either with the repacking of cars or in connection with wheel changes. Proper repair-track stocks are important.

The Sub-Committee also looked into some of the wedge reclamation practices. It was their conclusion that results obtained by forging depressions into the top of the

wedge to compensate for worn metal require investigation. One road found forging of depressions into the tops of wedges results in increased upward deflection at the ends, causing wedges to lose proper contact with journal bearing.

Bituminous Coal Research Center Relocating

The Columbus, Ohio, and Pittsburgh, Pa., activities of Bituminous Coal Research, Inc., are being consolidated in the industry's new coal research center at 350 Hochberg Road, Monroeville, Pa.

Mechanical Division Appoints New Committee Chairmen

Reorganization of the AAR Mechanical Division Committees, in accordance with the resolution adopted at the San Francisco meeting last year, has resulted in the appointment of the following new committee chairmen whose terms are now limited to a period of three years: *Sub-Arbitration Committee*—C. W. Kimball, chief of car inspection, Southern; *Prices for Labor and Materials*—L. H. Schierbecker, general superintendent car department, Illinois Central; *Brakes and Brake Equipment*—R. J. Dewsbury, general air brake inspector, Chesapeake & Ohio; *Loading Rules*—N. A. Williams, engineer—car maintenance, Union Pacific; *Locomotives and Locomotive Fuels and Lubricants*—P. J. Finch, assistant superintendent motive power—diesels, Chesapeake & Ohio; *Wheels and Axles*—T. R. Fredriks, manager—applied research, New York Central; *Lubrication of Cars and Locomotives*—M. A. Pinney, engineer of tests, Pennsylvania; *Journal Roller Bearings*—H. J. Stein—assistant chief mechanical officer—engineering, Atlantic Coast Line.

Other chairmen who will continue in office until the expiration of a three-year

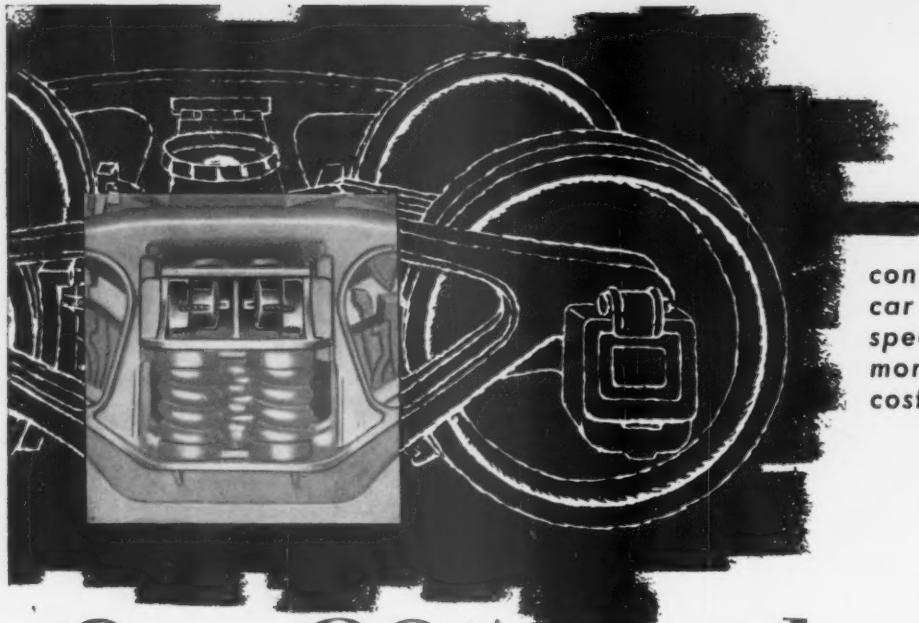
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TIME SAVING IDEAS FOR OCTOBER

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DEPARTMENTS

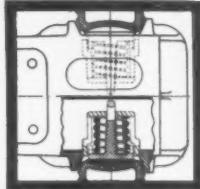
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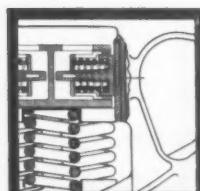
Save 80% over the cost of new Freight Car Trucks

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New Large control spring for full face pressure, longer life.

NEW



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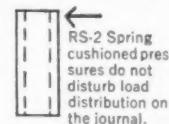
**for the finest in
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with the NEW HOLLAND RIDE STABILIZER RS-2

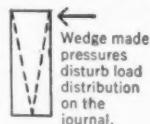
There's no need to let those serviceable old Freight Car Trucks be limited to slow speed service when you can convert them to profitable operation at a fraction of the cost of new trucks... The Holland Ride Stabilizer RS-2 has proven to give the same high-speed, loading-protecting, easy-riding characteristics you get in new, costly freight trucks.

You can convert any bolster of A.A.R. approved design and stabilize the ride laterally, vertically and longitudinally... The direct spring loaded control system of the Holland RS-2 **does not** cause uneven wear of the Journal Bearing when abnormal forces are exerted. Wedge made pressures just **do not** occur. Installation of the RS-2 components is unusually simple... And Holland Engineers will give you on-the-job assistance.

Write or call for the new Tell-All Bulletin RS-2.



RS-2 Spring cushioned pressures do not disturb load distribution on the journal.



Wedge made pressures disturb load distribution on the journal.

Holland Volute Snubber Springs



Either 2½" or 1¾"
Spring Travel.



STYLE E-2 Volute Snubber
Spring, 2½" Travel in
50 Ton Group.

Upgrades ride by introducing an unusually smooth snubbing action with an exceptionally high load carrying capacity. Holland's principle of utilizing the sliding action of telescoping radially compressed coils with ample friction area eliminates the "bombarding" problem.

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born at
Armco

2 FOR THE MONEY



Lay Armco Car Floors For BULK OR UNIT LADING

Give gondola, box or flat cars *multi-purpose* foundations with Armco Freight Car Flooring. Then there's no need to choose cars by floor type. Wood *plus* steel are the reasons.

Stout wood planks in Armco Flooring are *nailable*. Skids and braces are easily secured. Alternating steel hat sections deliver top beam strength and rugged floor surface. Both reinforce car frames, securely anchor your lading.

You can floor and refloor on a *production basis*, too. Armco Engineers supply detailed drawings after study of your car frames. Floors arrive coped to clear rivet heads or with special steel planks where nailing strips are impractical. Get complete information. Call your nearest Armco Sales Office or write Armco Division, Armco Steel Corporation, 2401 Curtis Street, Middletown, Ohio.



For strength,
durability
and economy

ARMCO Armco Division

(Continued from page 5)

term are: *General Committee*—J. W. Hawthorne, chief mechanical officer, Atlantic Coast Line; *Arbitration*—H. M. Wood, assistant chief mechanical officer (car), Pennsylvania; *Sub-Price*—L. L. Pierce, supervisor, AAR Department, General American Transportation Corp; *Freight and Passenger Car Construction*—N. A. Passur, engineer car design and construction, Southern Pacific; *Couplers and Draft Gears*—V. L. Green, assistant mechanical engineer—car, Milwaukee; *Safety Appliances*—C. E. Pond, general superintendent motive power, Norfolk & Western; *Specifications for Materials*—R. McBrien, director of research, Denver & Rio Grande Western; *Tank Cars*—M. R. Buck, mechanical assistant, Santa Fe; *Electrical Equipment*—*Rolling Stock*—J. W. Horine, electrical engineer, Pennsylvania.

Removal of Waste Packing Speeded by AAR

A newly effective, shorter repack period for cars presently equipped with loose journal-box packing and Plypak containers will speed the installation of approved lubricators. The AAR Mechanical Division, effective October 1, has revised Section (a) of Rule 66 to step up the elimination of loose waste. The revised portion reads:

"(a) Journal boxes on empty cars, not repacked within time limits prescribed below, as indicated by stenciling on car, regardless of the responsibility of handling company for change of wheels or other repairs, must be repacked. If empty or loaded car is on repair track for other work and packing date is one month less than time limits shown below, journal boxes must be repacked regardless of whether or not car requires other repairs."

Months

1. Cars equipped with all waste packed boxes	14
2. Cars equipped with Plypak containers	14
3. Cars equipped with journal lubricating devices	24

Where cars under authorized test are stenciled for repack period beyond periods shown above, the time period stenciled on car will govern. This work shall be done only where facilities are available."

Diesel-Electric Locomotive Orders

MISSOURI PACIFIC. *Electro-Motive*: 50 GP-18 diesel locomotives. Cost \$9,000,000. Trading in 1,500-hp FT's on new units as a part of locomotive replacement program. Delivery of GP-18's to start in January.

Freight-Car Orders

ARMOUR & CO.—*General American*: 120 10,000-gal aluminum tank cars. To be insulated with 4 in. of fiberglass and used to carry liquid nitrogen fertilizer. Cost, approximately \$20,000 each. For lease to Armour, together with 40 rubber-lined and 30 pressurized tank cars designed to carry anhydrous ammonia and phosphate fertilizer solutions.

CHICAGO GREAT WESTERN. *General American*: 10 70-ton Dry-Flo covered hoppers; 5 70-ton flat cars.

FLORIDA EAST COAST. *Pullman-Standard*: 22 Lo-Dek flat cars for handling automobiles. Cost, \$278,000. Delivered.

MILWAUKEE. *North American Car*: 25 Mark III Flexi-Van flats. On lease. Cars, now delivered, supplied by Strick Trailers Div., Fruehauf Trailer Co.

NEW YORK CENTRAL. *Greenville Steel Car*: 50 50-ton twin Flexi-Van Mark III flat cars. For delivery this month. Cost, slightly more than \$12,000 per car.

NORTHERN PACIFIC. *General American*: 20 70-ton, 2,600-cu ft Airlide covered hoppers. Estimated cost, \$300,000. In addition to 20 previously ordered (RL&C, Aug. 1961, p 6).

SOUTHERN. *Magor Car*: 200 aluminum-covered

hopper cars. Volume capacity, 5,000 cu ft; weight-carrying capacity, 100 tons. Cost, \$4,800,000. Deliveries to begin in November.

TRANSPORT LEASING CO. *Pullman-Standard*: 46 Chem-O-Vac covered hoppers—3,500 cu ft capacity. Equipped with stainless-steel center discharge outlets for pneumatic unloading of bulk chemicals. For lease to Union Carbide Corp.

UNION TANK CAR COMPANY shps: 75 tank cars. Delivered.

WESTERN MARYLAND. *Pullman-Standard*: 25 50-ton box cars; 14 70-ton, 89-ft 1-in. Auto Rack flat cars. For October-November delivery.

WESTERN PACIFIC. *Thrall Car*: 40 70-ton box cars; *General American*: 3 70-ton covered hoppers. *American Car & Fdry*: 10 100-ton, 4,000-cu ft capacity aluminum Center Flow covered hoppers. For delivery this month.

ZONOLITE CO. *Union Tank*: 2 4,000-cu ft capacity underframeless, aluminum covered tank hopper cars. On lease.

Notes and Inquiries

Pullman-Standard anticipates a \$1,000,000,000 market in rapid transit cars during next 10 years. Prediction based on increasing traffic snarls of America's fast-growing cities.

Soe Line Board of directors have authorized expenditure of \$1,300,000 for purchase of 40 50-ton box cars equipped with special loading devices; 6 special-design cars for tin-plate loading; 20 4,000-cu ft capacity covered hoppers; 20 52½-ft gondolas for loading steel billets; 15 85-ft TOFC flats. Will also lease 25 45-ft TOFC flats. All cars to be equipped with roller bearings and delivered by end of year.

Howell, Ind.: *E. N. BASKETTE* appointed master mechanic, succeeding *J. W. OAKLEY*, retired. Mr. Baskette formerly general foreman at Radnor, Tenn.

Milwaukee, *Wis.*: *F. A. UPTON*, superintendent motive power, appointed general superintendent motive power. *G. L. WOODS*, superintendent car department, appointed general superintendent car department.

Norfolk & Western. — *Bluefield, W. Va.*: *SYLVESTER C. MCKINNEY, JR.*, appointed assistant enginehouse foreman, succeeding *J. R. WITT*, retired. *GARLAND G. BREWER*, shop inspector, appointed mechanical inspector.

OBITUARY

Leo B. George, 65, retired chief of motive power and rolling stock, Canadian Pacific, died Sept. 5.



The Auto-Porter, a German-built, three-unit, articulated car with two-wheel trucks, which can carry 16 compact type autos, or 12 standard size models, has been undergoing tests on the Baltimore & Ohio. Spring cushioning, roller bearings, and a special hydraulic draft gear reduce the effects of impact on the car, the height of which, from track to deck, is

2 ft 4 in.—13 in. less than the standard flat car. The Auto-Porter, built by Graaff-Elze in West Germany, is being shown in this country by North American Car Corporation and B&W Enterprises. In Europe, 1,500 are said to be in regular service. Initial estimates of the cost of loading have been set at less than \$1 per auto.



SPECIAL-PURPOSE...



OR STANDARDIZED DESIGN...

both are Bethlehem-built

The bulkhead flat at the top was designed and built by Bethlehem specifically for the transport of gypsum board—a tricky lading if there ever was one. Says one traffic executive: "Best job-engineered car we've seen up to now."

The 70-ton hopper, also built by Bethlehem, combines the advantages of standardization with modern production techniques, and has an anticipated service life of at least 18 years. Bethlehem cooperated closely with the committee of engineers which designed it, and has built it in quantity for the Pennsylvania and two other large coal carriers.

Bethlehem's car shops are manned and tooled to fit right in with the railroads' pressing need for more efficient rolling stock and lower operating ratios. We'll be glad to hear from you.

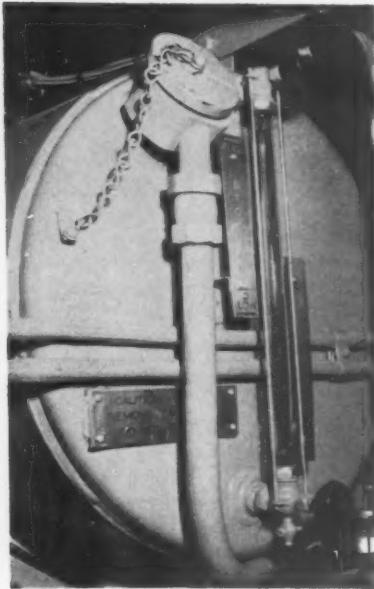
BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

Export Sales: Bethlehem Steel Export Corporation

BETHLEHEM STEEL



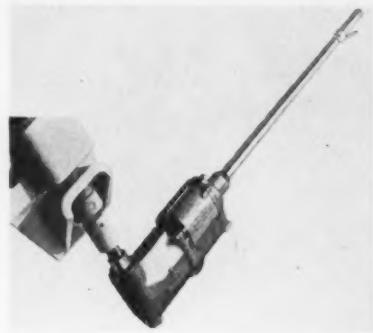
LOCOMOTIVES AND CARS WHAT'S NEW IN EQUIPMENT



Diesel Cooling System

A pressurized cooling system which insures cooling water flow under high temperature

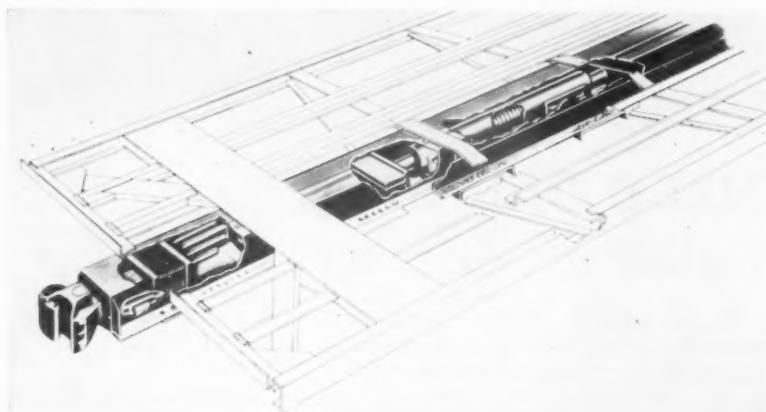
conditions due to tunnel operations, radiator clogging, shutters partially closed, etc., is currently a basic application on GP and SD locomotives. A pressure relief cap permits the cooling system pressure to build up to approximately 3 psi as the water is heated to operating temperature. By pressurizing the system which raises the boiling point of the water 8 to 12 deg F at the water pump inlet, positive water flow is assured at the higher operating temperatures. With this closed system, evaporation losses are reduced. Refilling and adding of water treatment is practically eliminated. *Electro-Motive Div., General Motors Corp., Dept. RLC, La Grange, Ill.*



wrench weighs 40 lb. Its throttle is a lever-type, rather than a roll type. *Chicago Pneumatic Tool Co., Dept. RLC, 6 East 44th st., New York 17.*

Trailer Hitch Wrench

The CP-3450-RPB air-driven wrench, according to the manufacturer, won't burn out as the result of a stall. It is applicable for use with all ACF trailer hitches and is said to operate most piggyback trailer hitches two to four times as fast as previous methods. ACF field tests have shown that the tool, operating at 300 rpm, elevates the hitch and locks it to the trailer kingpin in 32 sec, compared with 124 sec using other power wrenches for TOFC tie-down. Unlocking and lowering process requires 25 sec as against 92 sec previously needed. The



Super-Cushioned Underframe

A sliding sill provides frictional resistance to supplement cushioning elements in the Waugh Super-Cushioned underframe. Cushioning is effected by means of ring springs in a sealed, grease packed tubular steel housing, and a series of rubber Waughmats working between steel plates to cushion first shock of impact. At a 350,000-lb coupler force, the Type 150-8 underframe, through the combined resistance of the Waughmats, the friction of the sliding sill, and the ring springs, develops a total capacity of 150,000 ft-lb, providing more than six times the protection obtained from a friction gear.

At the same coupler force, Type 170-10, which has a greater number of ring springs and longer travel, develops a capacity of 170,000 ft-lb. In the Type 150-10-S, a special development, a snubber is substituted for one group of ring springs so that the car is equipped with the ring-spring unit at one end and with the Waugh snubber at the opposite end. This type develops a capacity of 150,000 ft-lb. Recoil is practically eliminated and coupler force reduced to 26,000 ft-lb. *Waugh Equipment Company, Dept. RLC, 420 Lexington avenue, New York 17.*

Lettering Kit

The "Let-R-Set" kit, which utilizes pre-cut pressure sensitive plastic film letters and numbers, is now available in 1-, 2-, 3- and 4-in. size characters and in white, black, yellow, blue, red, gold, aluminum, chrome, fluorescent red orange, and fluorescent yellow orange colors. *Demp-Nock Co., Dept. RLC, Warren, Mich.*

Nylon Castings

A nylon casting process makes available nylon shapes for side bearings, brake system bushings, dies, and similar parts requiring wear resistance and impact strength. This MC nylon material is a Type 6 nylon formulation which can be cast at atmospheric pressure in large sizes and without expensive molds. It is said to have good frictional characteristics, light weight, corrosion resistance, and electrical and thermal properties comparable with those of similar plastics. The MC nylon is also available in stock shapes such as tubes and plates. *Polymer Corp., Dept. RLC, 2120 Fairmont ave., Reading, Pa.*

Automated Flame Cutter

A computer controlled flame-cutting machine has been developed by Air Reduction in cooperation with General Electric. The Tapeograph is an automatic rectilinear bridge type unit capable of cutting straight lines and contours in plate of any length, 22 ft in width and up to 6 in. thick. No templates or template tables are needed. The cutting system consists of two main components—the director, a GE Mark Century numerical contour control system, and the cutting machine proper. Predetermined, numerically coded instructions automatically control flame-cutting operations. Under the Airco system, the part to be cut is designed and engineering drawings prepared. Dimensional information extracted from

(Continued on page 44)



Lets one
man do
the work
of three!

The built-in hypocycloid gear is the power secret! Free to follow the eccentric crankshaft, but not free to rotate itself, it produces a 6:1 reduction ratio.

*Patent Pending

NEW! Wine Power Geared* Discharge Gate

EVEN UNDER A 70-TON LOAD one man can open this new gate. Accurately machined mating surfaces provide bind-free operation and a tighter seal. No more sledgeing or car damage in attempts to open "frozen" hopper doors. Electric steel castings eliminate distortion.

PRECISION-MESHED GEARS without costly machining! Amazingly accurate shell molding process helps keep unit competitively priced despite *Power-Gear* features. Rack-and-pinion principle assures parallel operation without side binding. All bearing surfaces are lubricated with Moly Disulfide.

COMPLETELY PREASSEMBLED for easy installation, ready for welding. No further fitting, no extra parts required during assembly of car. 13x24" opening fits most standard chutes. Interchangeable with most present gates; equipped with standard boot groove. Conforms to all recognized unloading devices. Now in service on six major railroads and a car leasing company. *

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Railway Appliances

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EDITORIALS

Those Excellent Exhibits

We do not have an exact count on the attendance at the September mechanical meetings at Chicago but the registration was near the 4,000 mark. No matter what the attendance was we believe it should have been much larger because the exhibits were outstanding.

The inside exhibits at the Hotel Sherman were truly wonderful. The track exhibit, however, stole the show. Every man that saw the cars and equipment displayed on about a mile of track was impressed by the fact that every car and every piece of equipment was designed and built for a specific job. They were evidence that more research and development of railroad equipment have been done in the past few years than in any time in the history of the railroads.

The exhibits offered a fine opportunity to see the tools the railroads must have to retain and recapture traffic. We are sorry if you missed the show. They were worth the time and expense of the trip to Chicago.

More Than Lading Protection

Application of hydraulically cushioned underframes to piggyback cars, to tank cars for hauling liquid hydrogen, and to full-door box cars may mark the beginning of a new trend in car construction. Previously, high-capacity, hydraulically cushioned underframes were applied to conventional box and flat cars where they could give maximum protection to fragile ladings. While long-travel underframes do protect the loads on all cars to which they are applied, their use can also make possible new car designs and new construction techniques. When car structures are no longer required to absorb the high-energy longitudinal impacts which yard and train operation develop, structures can then be simplified and lightened. Completely new arrangements are possible.

Pullman-Standard recently stated that its Hydroframe-60 underframe made possible the Full-Door box car (RL&C, September 1961, p 65). "Heretofore," P-S reported, "a car on which the entire side opened up would not have been feasible because of the severe wracking and distortion of the body structure that would result from coupling impact forces."

General American and Linde recently cooperated in the production of liquid hydrogen tank cars which move their super-cold ladings at 423 deg F Below zero. Each car is basically a "thermos bottle" arrangement having a highly insulated inner tank within an outer shell. "Because structural supports between the inner and outer shells represent paths for heat flow, it was necessary to make these supports as small as possible," General American reported. "To reduce the size of the members and yet resist the longitudinal impacts developed in train operation, the Hydracushion underframe was utilized."

When used on piggyback cars, the high-capacity under-

frame arrangements can simplify tie-down arrangements and may simplify the transportation of trailers, containers, and racks on a car of a single basic design.

Car designers already are taking advantage of hydraulic cushioning to produce new types of cars. It is probable that much more will be done. It should also be possible to redesign existing types of cars with substantially less material, or with completely new materials.

Production in Maintenance

The railroads have made great progress in utilizing the steel wheel on the steel rail to produce efficient transportation yet they have been relatively slow in applying production principles to shop and terminal maintenance work. They appear to be backward in this respect because all American industries have been characterized by an exceptional talent—the ability to plan and set up production lines. And our railroads are an outstanding example of a production line with a ton-mile output per man hour greater than any other form of land transportation.

Whatever the reasons for the lateness in applying production principles to maintenance work, the current critical economic condition of the railroads has accelerated the adoption of repair and shop layouts and the installation of tools and equipment that reduce maintenance costs. Car spot repair systems have been installed in volume only during the past few years although the Norfolk & Western had put in such a facility about 15 years ago at Bluefield, W. Va., based on the production line principle of moving the work to the men, tools and materials.

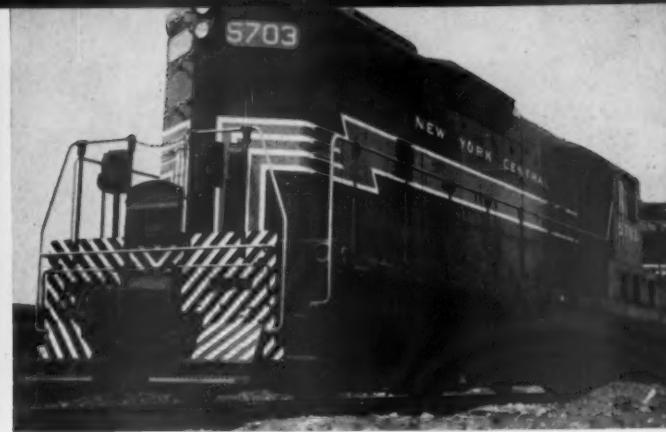
The same principle is currently being applied to diesel locomotive inspection and maintenance work and adoption of this spot system is proceeding at a more rapid pace. The first such system went into operation on the Southern Pacific at Ogden, Utah, early in 1959 (RL&C, Dec. 1960, p 23) and already several railroads are equipped with locomotive spot inspection and maintenance layouts.

Three basic types of spot system shops were ably presented by S. C. Snow, superintendent motive power, Louisville & Nashville, and chairman of the Shop Equipment Committee, Locomotive Maintenance Officers' Association, on September 11 during the association's annual meeting. The committee report, summarized elsewhere in this issue, showed variations in layouts and procedures to meet different requirements of individual roads. Although the layouts differ they all have one thing in common—they produce maintenance work at less cost through the advantages inherent in moving the work to men, tools and materials.

Wherever repetitive maintenance and repair work exists the opportunities to reduce non-productive time by applications of the same principle are also present. Some railroads have done a fine job in this respect but many more could profitably explore these possibilities for potential savings.



Spectrometer at Cleveland Research Center shows that wear in locomotives using Talona RS Oil 40 is negligible. Lab technician in foreground prepares samples.



Amazing performance record of Talona RS Oil 40 was set up in EMD diesel locomotives. Oil was used on heavy-duty freight operations.

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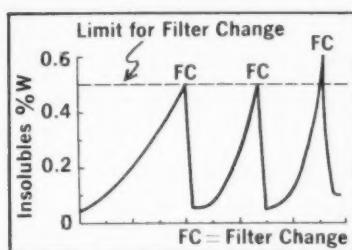
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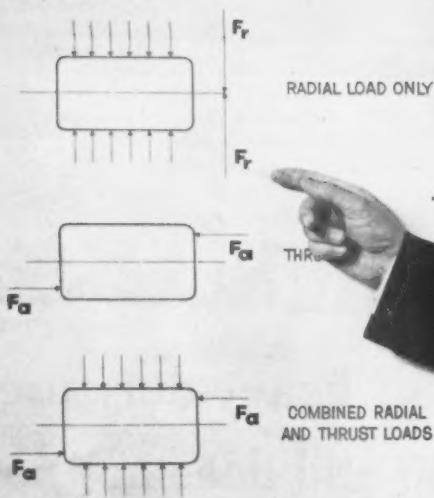
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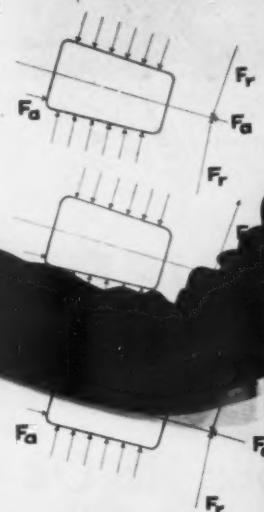
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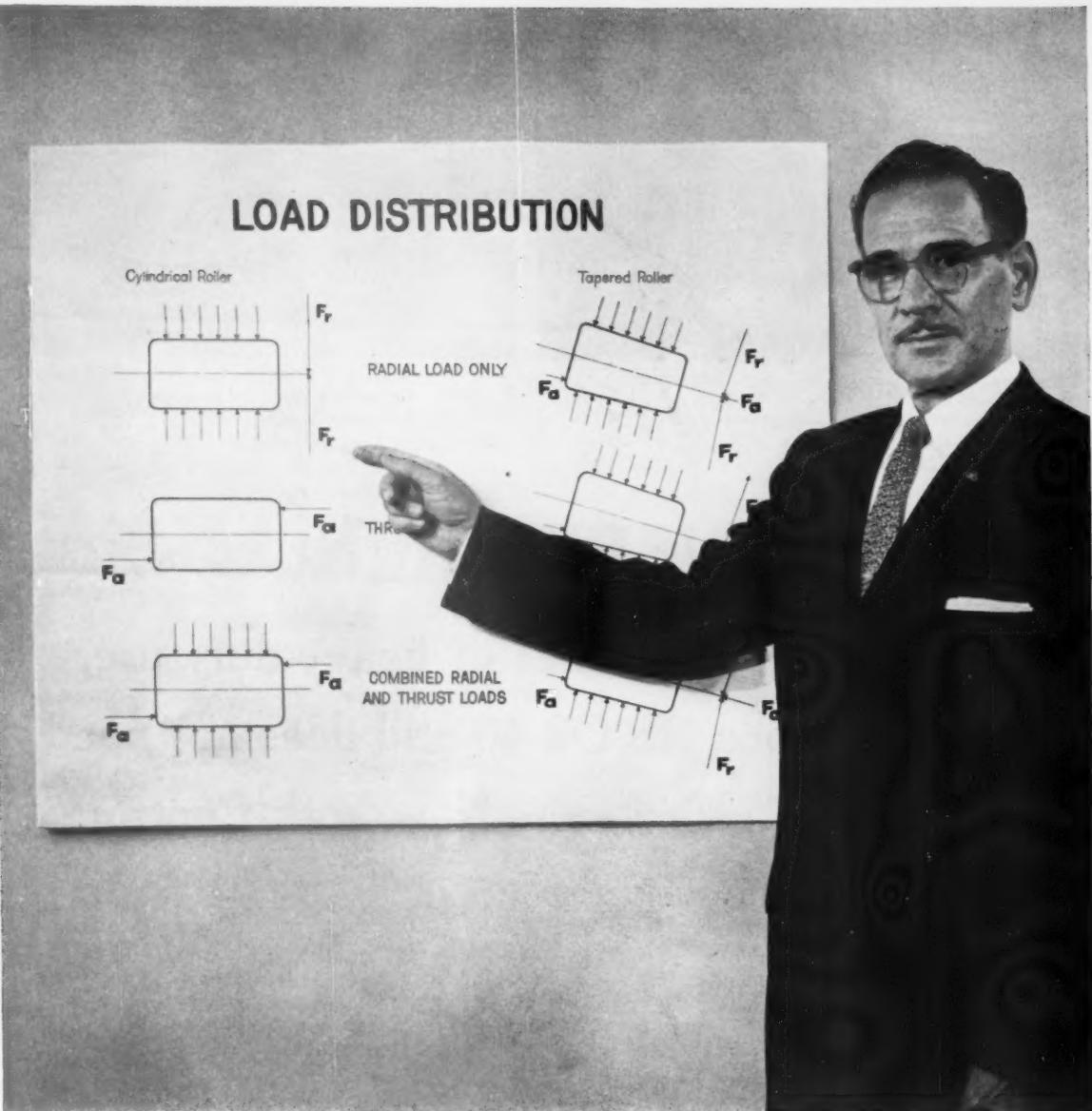


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Estimated 5,500 attended meetings and viewed exhibits. Emphasis on specialized freight cars was evident at track exhibition.

Coordinated Studies New Problems

Equipment and maintenance methods are changing; exhibit shows new developments coming rapidly

Marketing, public relations, and political activities must match the pace being set by railway equipment designers if the investment which railroads are making in new motive power and rolling stock is to pay off. This was stressed by several speakers at last month's Coordinated Mechanical meetings in Chicago.

Simultaneously, the exhibits of the Allied Railway Supply Association demonstrated how rapidly new car and locomotive components and completely new types of cars are being developed. Approximately 80 pieces of equipment were shown by 40 exhibitors on almost a mile of track along Chicago's lake front, and 121 suppliers participated in the exhibition in the Hotel Sherman. Emphasis was on cars designed for specialized transportation assignments. "The \$20 million of new equipment," according to the American Railway Car Institute, "was developed to enable railroads to capture a larger share of the freight business by replacing general-purpose cars with economical and efficient rolling stock designed for specific transport jobs."

"The extraordinary problems which railroads and suppliers face in the decade of the Sixties cannot be met by ordinary 'run-of-the-mill' methods," Reading President E. P. Gangewere told the annual luncheon of the Air Brake Association, Locomotive Maintenance Officers Association, Car Department Officers Association, and Railway Fuel and Operating Officers Association.

Calling for the simultaneous surmounting of what he termed "Six Steps for the Sixties," Mr. Gangewere predicted that "Transition through Technology," Step One, will continue at an accelerating pace. Along with increased locomotive efficiency, he foresaw progress in remote control of railroad operations, replacement of the box car by containers, increased standardization of rolling stock, and more effective management control. "We should recognize that the railroad is really nothing more than a continuous conveyor belt . . . which can compete successfully with the bulk-moving ability of water carriers, the speed and flexibility of highway carriers,

and the specialized transportation of the pipeline," he said.

New concepts which will enable railroads to offer services and prices that will make it possible for them to compete for traffic were indicated as Step Two in Mr. Gangewere's plan. The remaining four steps: Improving the Service, Pricing for Profits, Selling with Spirit, and Winning Public Opinion.

"Acceptance of the fact that it is time for a complete cure of transportation policy defects is the one step that must be accomplished if the railroads, and transportation as a whole, are to survive this decade," Mr. Gangewere warned.

"Many of the problems which beset the railroad industry are basically legislative and political in character," C. M. Roddewig, president of the Association of Western Railways, told a CDOA meeting. "These difficulties are so severe as to almost preclude any real progress within the industry through new technology unless they are remedied.

"It has been a combination of equipment, price, and service that has

Coordinated Mechanical Associations



E. P. Gangewere,
Reading



C. M. Roddewig.
Assn. West. Rys.



E. P. Butler,
ICC



S. D. Moseley,
GATC



C. N. Wiggins,
L&N

brought about the tremendous growth of piggyback business," Mr. Roddewig explained. "Development and use of new equipment sometimes run into financial difficulties, but not into regulatory problems of the type that are today strangling the American railroads. When railroads have attempted to bring into play the second ingredient in attraction of new business—pricing of service when handled in new types of equipment—they have run into serious governmental restrictions. We have real trouble passing on to the shipping public any of the transportation economies which are made possible by the equipment innovations. This is true not only in piggybacking and container service, but also with respect to the newly developed bulk and liquid-commodity cars as well."

Mr. Roddewig then described the legislative, regulatory, and public relations fight in which the railroads were involved by the Teamsters Union, motor carriers, and water carriers over Senate bill S1197 in the last session of Congress. Mr. Roddewig praised the efforts of railroaders who wrote to the Senators in unprecedented numbers expressing opposition to the bill which failed to come up for action in the recently concluded session.

"In this age of rapid advances in technology, railroad practices can become obsolete overnight," C. N. Wiggins, assistant general manager, Louisville & Nashville, told the LMOA. "Line production methods of repairing cars, locomotives, and their appurtenances are a necessity . . . New methods of handling our customers' goods, such as auto racks, piggyback, and cushion underframe cars, are providing a potential growth factor that

can, and will, bring back to the rails business lost to competitors . . . We must not be satisfied with our operations until all waste both in manpower and material is eliminated."

Containers Coming

A prediction about the future of containerization was made for the CDOA by S. D. Moseley, president of General American Transportation Corp. Calling the container the "lowest common denominator of transportation," Mr. Moseley looked to 175,000 of these boxes in service ten years from now. "Value of the container goes beyond its concept as a vehicle," he said. "It will make possible a whole new concept of distribution."

The vice-president of operations of a very important railroad recently said that within the next five to ten years he expected that 75% of the commodities now carried in box cars would be moved in containers. The chairman of another railroad questioned the wisdom of investing in new box cars because of the probability of their early obsolescence due to containerization.

"We are much closer to general standards in the container field than could have been hoped for 12 months ago."

Mr. Moseley then proposed that containers be supplied by shippers or by an equipment pool, citing the simplification of distribution, maintenance and accounting. It would also make it possible for railroad efforts and capital to be directed towards improving plant and rolling stock. Customers must have cars that can take both trailers and containers interchangeably and in mixing loads for

the trailer will remain an important vehicle to the railroads.

"In my opinion," Mr. Moseley concluded, "The opportunity for the railroads has not been brighter in decades than at the moment."

Commenting on the improved hot-box record, F. Peronto, executive vice-chairman of the AAR Mechanical Division, said it is not due solely to lubricators. He said that over the past few years the Division's program has also involved lubricants, bearing design and metallurgy, journal finish, improved wedges, elimination of cast-iron wheels, and improved truck designs. Currently, 72% of the U.S. freight-car fleet is equipped with lubricating devices.

Vigilance should be exercised by the railroads so that all defects and conditions, or combinations of conditions, that indicate a defect may be developing, will be found at the time of inspection, E. R. Butler, assistant director of locomotive inspection, ICC, told the LMOA.

The 49th Annual Report of the Director of Locomotive Inspection to the ICC showed numerous accidents and casualties which "could have easily been avoided if proper visual inspection and repairs had been made. Of the 50 accidents reported during fiscal 1960, 15 were caused by defective floors, steps, passageways, and cab seats. Eight of these were caused by defective cab seats, while seven resulted from oil on walking surfaces. These defects, without a doubt, could have easily been detected at the time of the last 24-hr or calendar-day inspection. They could have been corrected before accidents occurred."

Reports of some of the committees are summarized on following pages.

CDOA Seeks Changes in AAR Rules

Elimination of the step size requirements for axle turning, revision of the recently completed piggyback interchange rules, and fixing as an originating road responsibility all load adjustment and blocking necessary on cars en route were among the recommendations made to the AAR Mechanical Division by the Car Department Officers Association last month. Interchange Rules, Open-Top Loading Rules, Wheel and Axle Manual and other Mechanical Division regulations could be involved if CDOA recommendations are adopted.

The railroad on which a car is loaded should be responsible for all adjustment and strengthening of load securities which must be performed before car reaches its destination, the CDOA Committee on Loading Rules urged. Citing Rule 1, Paragraph A of the General Rules of the AAR Open-Top Loading regulations and the Preface to these rules, which require that cars in suitable condition must be loaded in compliance with mandatory AAR requirements before being accepted from shippers, it was felt that the entire responsibility for subsequent work is that of the originating railroad.

"The placing of good-order cars for shippers is of prime importance in proper loading," the Committee said. "When floors are decayed, broken, or missing, regardless of how well securities are installed, the lading will shift en route. Loads will be delayed and there will be unnecessary expense to handling lines." C. W. Kimball, chief car inspector, Southern, urged that roads check cars for broken bolsters and center sills before they are placed for loading. This, he said, should also be an originating road responsibility.

The Loading Rules Committee reported that railroads frequently ship wrecked freight cars loaded unsafely in gondolas or on flat cars. During discussion, it was stated that this does not set a good example for other shippers. It was also recommended that laminated side stakes, now approved for use only in section 5 of the Loading Rules, be permissible for any lading requiring side stakes. "Your Committee feels that laminated stakes will have more strength than solid stakes," the Committee reported.

Flat cars are frequently equipped with stake pockets which have such sharp edges that they cut lading bands. This condition will require action, H. L. Price, mechanical assistant, Santa Fe, warned.

Calling attention to Paragraph b of General Rule 8 concerning idler cars used with long shipments, the Loading Rules Committee reported that the required minimum clearance of 4 in. between the overhanging load and the deck of the car is insufficient. In hump yards and on other tracks with vertical curves, this has proved to be inadequate. "It is the opinion of this Committee that the rule should be modified to require a greater clearance between car decks and lading in order to prevent derailments," they concluded. It was pointed out

that the wording of the rule is "to maintain 4 in. clearance" and that this might imply that greater clearance should be provided initially, even under the present regulation.

H. L. Hewing, superintendent of interchange, Chicago Car Interchange Bureau, reported that Loading rules for open-top and closed piggyback trailers are to be issued soon. They will not be mandatory, he said.

Interchange Rules

The interchange rules for piggyback trailers which became effective on January 1, 1961, require some revision, according to the CDOA Committee on Road-Rail Transportation. "This Committee believes it is time that they be re-evaluated. These rules were formulated as a guide to a fair and proper adjustment of all questions arising between trailer owner and handling company, with the intent of making trailer owner responsible for, and chargeable with, repairs necessitated by ordinary wear and tear in fair service."

The Committee on Interchange Rules reported that, in addition to several revisions in the piggyback code, the "Trailer Interchange and Safety Inspection Form, J-1" should be eliminated. The Committee called it "impractical, unworkable, and unenforceable." Subsequent discussion indicated that many others had reached the same conclusion. It was pointed out that it is based on a form used for interchange between truck lines and is not readily applicable for railroad interchange. The safety inspection of such ICC items as trailer lights and brakes cannot be made while a trailer is loaded on a piggyback car. The J-2 form can take care of visible damage to trailers, and interchange inspectors are unable to cover many of the items specified in the J-1.

K. H. Carpenter, superintendent car department, Erie-Lackawanna, said that the J-1 is impractical. He said that the so-called "Cleveland Agreement" negotiated five years ago by roads then interchanging piggyback traffic had proved to be a workable plan. When the AAR was considering its own piggyback interchange code, these lines recommended that trailer owners be made responsible for ordinary trailer damage. He said that the present piggyback situation parallels that which prevailed in freight car interchange when original rules made the handling line responsible for ordinary wear and tear. This has gradually evolved to make these conditions primarily owners' responsibility.

To simplify billing procedure by eliminating counterbilling in cases of wrong wheel application and to prevent evasion of responsibility for application charges in such instances, the Committee has recommended changes in Interchange Rules 5, 10, and other applicable rules. To be eliminated would be present requirements that a defect card be furnished by repairing line for application of wrong wheels. In lieu

thereof, it would be required that repairing line make no charge for application of wrong wheels when change is due to owner's defect.

Another proposal, covering Rule 94, second paragraph, would include labor and material for associated parts which must be removed from cars in making repairs. The Committee reported that "extensively damaged cars are being carded home where it is uneconomical to repair them because of the cost of renewing flooring and lining during the course of making repairs. Total cost exceeds or approaches net depreciated value less salvage. To collect on defect card under the present rule, repairs must be made or the car owner is forced to lose the difference between the amount he can bill and the net value of the car. Car owner should be privileged to bill for labor and material for all undamaged associated parts which must be removed and replaced in connection with repairs; the charge should not exceed the net depreciated value of the car less salvage."

To extend the service life of axles, the cost of which is rising steadily, the Committee on Wheels, Axles and Wheel Shop Practices proposes the elimination of step size requirements in axle turning. "The net effect of this proposal will be to allow axle lathes an additional 0.080 in. of journal diameter below the current G-1 and G-3 step sizes to clean up an unserviceable journal," the Committee stated.

When it is necessary to refinish an axle, only that amount of metal sufficient to restore the journal surface to proper operating condition would be removed. Rule 86 of the Interchange Code and the Wheel and Axle Manual would be amended. "To live with this proposal," the Committee said, "all references to the G-1, G-3 and G-5 axle dimensions, as well as the tabular annotation thereto, must be necessarily eliminated. This will in no way affect the step size bearings, the controlled clearance gages, or the current rules and procedures involving their use and function."

The proposed form of the second sentence on page 204, Interchange Rule 86, would be "... Where journal diameters are such that it would be wasteful of labor and material to adhere to these tolerances, it is permissible to reduce the diameter of journals on secondhand axles as much as is required to restore the axle to serviceable condition, provided the diameter is maintained within the shop condemning limit . . ."

Elimination of the step size journals is only the first phase of a program which should also see elimination of step-size journal bearings, according to C.W. Kimball, chief of car inspection of the Southern. He said that, if the step bearings were abandoned, it would be possible to reduce stocks, avoid application of improper size, and make it unnecessary for carmen to use the delicate journal gages.

In 1957, the CDOA Committee on Mechanical Refrigeration originated a tabulation of all mechanical refrigerator cars

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giving data on the make and model of engine, compressor, thermostat and electrical system, and on the type of air distribution, temperature range, and number of refrigerating units. This tabulation was taken over in 1960 by the Car Service Division of the AAR which now publishes it annually. This year, the Committee has prepared a similar listing of piggyback trailers with mechanical refrigeration equipment.

Recognizing, as with the mechanical refrigerator cars, that the servicing and maintenance personnel of the railroads must take care of piggybacked refrigerated units in trouble on their railroads, the Committee

began compiling and tabulating the information as to ownership, identification, types of engines and refrigeration equipment, kind of fuel, and capacity of fuel tanks for railroad-owned or railroad-operated equipment presently in use under Plan 2. Although practically all trailers in the country may be handled piggyback under some

plan, it was impractical to compile such an extensive listing. It is anticipated by the Committee that the tabulation of trailers and containers of the mechanically refrigerated type used under Plan 2 will grow in size and completeness, eventually being taken over and published annually by the AAR Car Service Division.

Spot Shops Offer Diesel Economies

One of the major problems facing railroads is the labor cost involved in diesel-electric locomotive maintenance, the Shop Equipment Committee of the Locomotive Maintenance Officers Association reported. Essential to lowering this cost is full utilization of man-hours at a diesel maintenance facility. A few factors involved in lost man-hours are inadequate tooling, improperly trained personnel, inefficient plant layouts, and travel by mechanics to and from job assignments.

While not completely eliminating non-productive time, some railroads now operate spot systems for periodical inspection and repairs to diesel-electric units. The committee has studied three basic arrangements for these progressive shops:

- The straight-through shop;
- The split-track shop;
- The roundhouse spot shop.

On the straight-through spot system a diesel unit travels along one track through a series of work stations, at each of which a predetermined amount of work is assigned. The basic idea is to bring the locomotive units to the men, tools, and material, eliminating unproductive time and safety hazards. The advantages of this type of shop are:

- Minimized movement of units;
- Low construction costs, assuming a shop building is available;
- Good parts flow.

Two principal disadvantages are that units are captive, moving through all "spots" regardless of repairs needed, and units are also "bottlenecked" while waiting their turn to enter the line.

The split-track shop, as proposed by the committee, would have three tracks through the shop with a transfer table connecting them just beyond the first station. A unit could go to any one of the three inspection positions and then, utilizing the transfer table, traverse a light, a medium, or a heavy repair line. One of the three tracks beyond the transfer table would be permanently assigned for each of the three types of work. The advantages of this arrangement are:

- Units requiring only light servicing could be returned to service quickly;
- Compact facilities for good control and supervision;
- Good parts flow.

Disadvantages include the high construction cost and inability to use existing facilities readily. While the split-track plan does not have the disadvantages of the straight-through system, installation of a transfer table in an existing shop is quite costly.

The roundhouse spot shop, as used by one railroad, is a six-position operation with two pits per position. The workmen, tools, and materials are located on a platform between each pair of pits. First, a unit is placed on a vacant pit at Position 1. Utilizing the turntable, it then moves to a vacant pit at Position 2, and so on.

Some of the advantages offered by this plan are:

- Workmen are not idle while the line is being moved because there can be a second unit at each position on which the workmen can go to work.
- The bottleneck previously discussed is partially eliminated, because there are two pits at each position.
- Units are not trapped. If a unit does not require the work normally performed at a particular position, the position can be bypassed.
- Many railroads have roundhouses and turntables which could be utilized.

Many variations from these basic arrangements are possible. The basic plan and the variations that will be most suited to a road's needs will be found by studying the factors involved.

Basic factor in determining the number of stations required and how to man these stations is the total number of diesel units to be inspected or maintained in a given period. With proper planning, a more even work flow will result, and lower maintenance costs and a substantial improvement in locomotive condition can be achieved.

An important point in planning a spot shop for scheduled maintenance is that it must function like any assembly line. Work at each station must be assigned, even to the most minor operations. The work must be planned so that each station will have a definite amount of work which can be properly completed in the allotted time with the personnel assigned to the location.

If careful control is not exercised, bottlenecks can develop in spot systems. Even routine operations may seem to involve considerable out-of-service time for locomotives. Consider a shop with a four-spot straight-through track which allows 1 hr at each spot. Five units arrive at noon. The first unit will be placed on Position 1 at 12 noon, and will be outshopped at 4 pm. The second unit must wait an hour before being placed on Position 1 and will be outshopped at 5 pm. The last unit is placed at Position 1 at 4 pm and will not be outshopped until 8 pm.

Shops equipped with adequate tools and equipment and having properly trained per-

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sonnel make it possible to better utilize man-hours and to reduce time lost between job assignments. A more even work flow can produce lower maintenance costs and substantial improvement in the condition of motive power.

Subsequent discussion about spot systems for single-end shops indicated that the system's savings might easily justify the construction of a through track, or even a new building.

F. H. McHenry, master mechanic, New York Central, commented on the bottleneck problem discussed by the Committee: "That

is no different from running any type of shop but is a point that must be closely controlled." He reported that the NYC Collinwood, Ohio, shop (RL&C, August 1961, p 30) calls for units one week in advance, seeking to have them arrive on a specific day so that shop loads can be balanced. At Collinwood, seven units are completed each 8-hr shift. The shop maintains 675 locomotives on a single-track, 6-spot system. Mr. McHenry indicated that the units were being maintained with approximately 250 fewer people and that their condition was as good, or better, than had been the case

when they were assigned to various shops.

R. E. Harrison, manager, maintenance planning and control, Southern Pacific, said that when rearrangement of the spot facilities at his road's Sacramento, Cal., shop is completed, it is expected that maintenance will be done with only 25% of the force necessary to maintain the locomotives some years ago at several different points.

K. L. Pollitt, manager, system assembly shops, Southern, said that 60 to 70% savings are resulting from the spot shop system maintenance as compared to old-style diesel shops.

Air Compressor Loading Determines Proper Lubrication

A well refined straight mineral oil, either naphthenic or paraffinic, in the proper SAE range will give good lubrication for normal air compressor operation, K. D. Relyea, Texaco, Inc., reported to the Air Brake Association. Other oil requirements for optimum performance include heat and oxidation stability, minimum carbon-forming tendencies, low volatility, and suitable flash and pour points. While some roads still use diesel engine lubricating oil in air compressors, many others are using oils considered better suited to the conditions peculiar to air compressor operation.

Proper oil conditions within the compressor should be accepted as a major feature of its maintenance. Oil condition generally reflects the performance of the compressor; excessive oxidation rates indicate abnormal operation.

It is most important that the oil be changed in the compressor crankcase when oil condition indicates this is necessary, Mr. Relyea said. To prevent impending failure, a noisy bearing is replaced when it is first discovered. Oxidized compressor oil doesn't "ring an alarm bell," but it can tell the same story as the noisy bearing. Frequently when the warning is not heeded, the end result is a compressor failure.

A 50% increase in viscosity at 100 deg F in a naphthenic oil and a 25% increase in a paraffinic oil are conservative limits. In a given grade, a naphthenic oil (Coastal stock) is higher in specific gravity, lower in API gravity, and lower in flash point than the paraffinic oils of the Appalachian region. Viscosity of naphthenic oils is more responsive to temperature changes.

Arbitrary time limits for oil changes do not take into consideration the operation of individual compressors and should be used with caution, Mr. Relyea said. Heavily loaded, air-cooled compressors may need an oil change every 30 days. Lightly loaded compressors may operate for 6 mos.

When oil is drained, the crankcase and oil screen should be cleaned and crankcase breather checked for proper operation. Debris and oxidized oil left in the crankcase can hasten oxidation of newly added oil.

Good air compressor lubrication starts at the air intake; air-borne dirt is a primary cause of wear. Oil seals, oil pump, oil pump screen and relief valve, crankcase, breather

and cylinder assemblies must be in reasonably good condition to control oil consumption and blow-by. Clean, properly seated valves and clean, water-free intercoolers are essential to good performance and control of heat which is the primary cause of oil degradation. Maintenance of proper oil level and pressure is also an important item which bears daily checking.

The choice of a satisfactory compressor oil is a compromise between conflicting requirements and properties, Mr. Relyea concluded. The naphthenic oils are more volatile. They burn more cleanly and produce smaller and softer carbon deposits. However, they are more viscous at low temperatures. The paraffinic oils have greater in-

herent oxidation resistance, but will produce more and harder carbon deposits. While handling of an additional oil encourages the use of diesel engine oil with its metallic ash constituents, this is not desirable because of the tendency to develop deposits.

Operating conditions and practices vary sufficiently between different roads so as to make one type of oil more acceptable than another. There are indications that the ability of mineral oils to lubricate compressors satisfactorily when operating at high discharge temperatures may be exceeded. Design modifications may be necessary to keep operating temperatures in the region where petroleum oils will perform without undue deterioration.

Journal Problems Need More Attention

Freight-car journal performance improved in 1960 over 1959, with average miles per hot box set off between division terminals rising to 225,975. Cars equipped with lubricating devices averaged approximately 690,000 miles per hot box, while those not so equipped averaged only 121,200 miles per hot box, the Car Department Officers Committee on Car Lubrication reported. "Improvement in performance can be attributed to the increase in application of lubricating devices and not to general maintenance and servicing," the Committee concluded.

Careful selection of lubricating devices also influences performance. A survey of several railroads revealed lubricating devices with top performance are averaging approximately 4,000,000 miles per hot box with some roads obtaining 15,000,000 miles per hot box.

Competition has reduced prices so that good lubricators can now be purchased for less than \$25 per car set, it was reported. The Committee went on to state that an extension of the repack period would make a low priced, one-use lubricating device very attractive. A large number of cars equipped with conditionally approved devices are now completing a 36-month repack test, and the results have been encouraging. The optimum repack period would be one which corresponds to the

AB brake cleaning period, presently 48 months. Cover and core materials of most lubricating devices will withstand 48 months of operation, but it is doubtful if they could be renovated and operated for another four-year service period.

Roller Bearings

"Performance of roller bearings continues to be excellent," the Committee said. There were 51 roller-bearing hot boxes reported in 1960 and only 146 in the past six years. In 1960 there were 2,713 bearings removed for reasons other than hot boxes from the 76,674 roller-bearing-equipped cars in interchange service.

Two major problems encountered on repair tracks since the number of roller-bearing-equipped cars has increased are:

- Wheel replacements for cars having wheel defects;
- Removal and shipment of roller-bearing wheel sets to distant points for examination after being involved in derailments.

It appears that the latter may become one of the major cost items in roller-bearing operation, according to the Committee. Overall roller-bearing maintenance cost for freight operation is yet unknown. The Committee urged all roads to follow their re-

(Continued on page 44)



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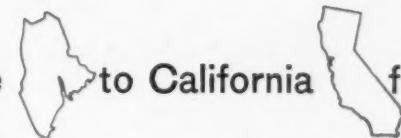
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Renovation—The MACPAD with NALUR is sturdily made —its rugged construction permits renovation by any standard method in railroad use.

Get the full story on the new *low-cost* MACPAD with NALUR. Ask our representative or write for details. Magnus Metal Corporation, 111 Broadway, New York 6, New York or 80 E. Jackson Blvd., Chicago 4, Illinois.

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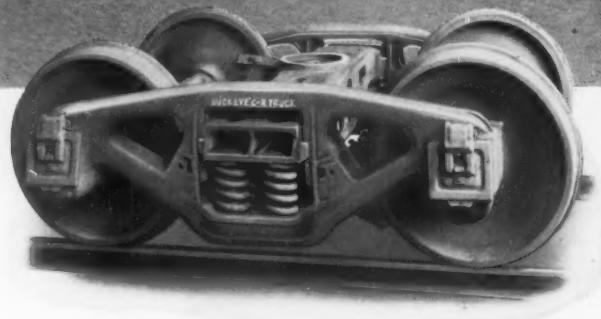
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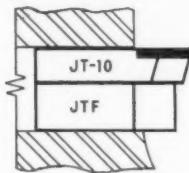
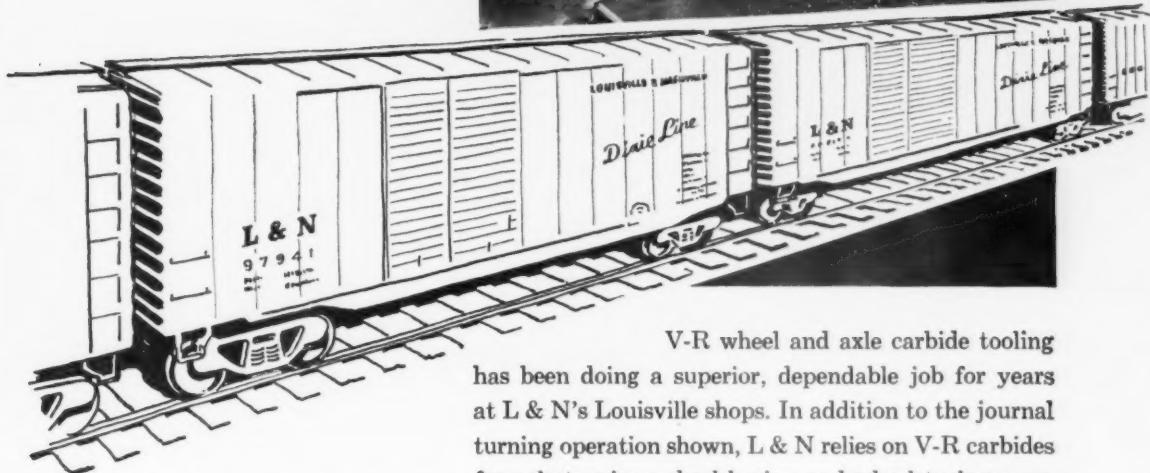
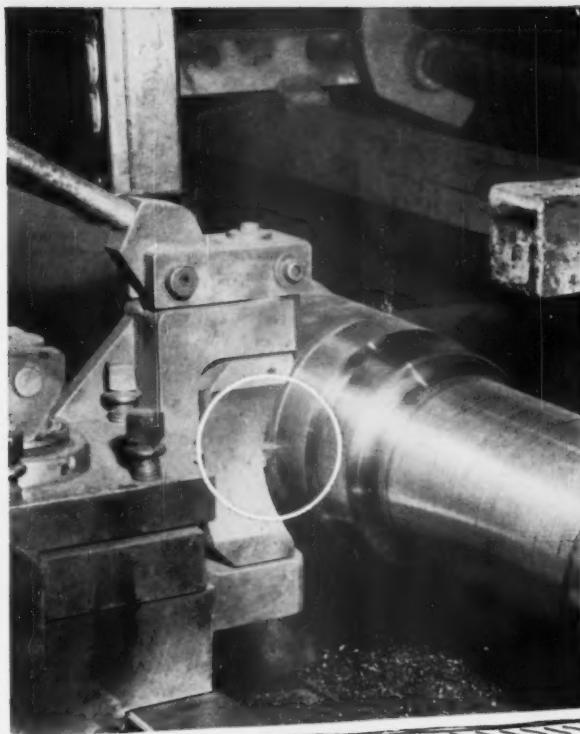
- Built-in durability with highest quality materials protects against wear and breakage.
- Maximum friction bearing areas assure extended service with minimum maintenance.
- Periodic service inspections indicate service life will outlast average freight car.

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uses

**wheel and axle
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L & N uses this new style JT-10 Journal Turning Tool with Style JTF Filler Block for greater economy with less grinding time.

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**FIFTY MORE GP-20's
Ordered by the**

SANTA FE



Fifty more General Motors 2000-hp GP-20's are joining the Santa Fe fleet of twenty-five GP-20's at work pulling the freights between Chicago and Kansas City. By turning in fifty 1350-hp freight locomotives, the Santa Fe is exchanging 67,500-hp capacity for 100,000-hp—a gain of 48%. This added capacity enables the fifty new GP-20's to do the work of seventy-four older FT's.

This is the essence of the General Motors Locomotive Replacement Plan.

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LA GRANGE, ILLINOIS • HOME OF THE DIESEL LOCOMOTIVE
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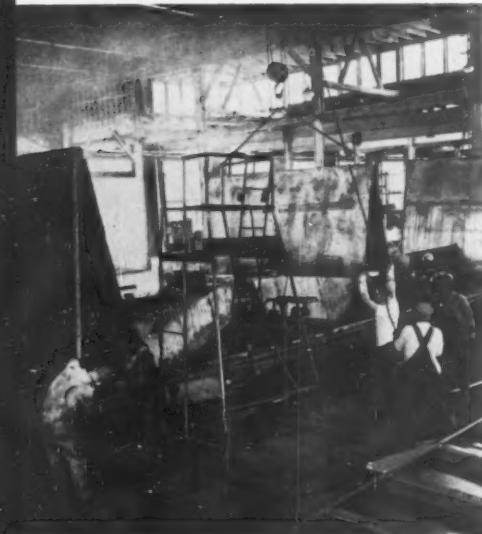


Coal haul on Santa Fe will be handled by 60 of these special hoppers which are now under construction at road's shop.

Hoppers Designed for Fast Unloading



Four-way valve controls simultaneous opening of all six sets of hopper doors on the car.



Steep slopes of cross ridges and longitudinal hoods are evident during assembly at Topeka.

Hopper cars now being built by the Santa Fe for a coal movement from New Mexico to a public utility in southern Arizona have air-operated drop doors. They will be used in conjunction with a remotely controlled 600-hp switcher which the utility has ordered for use at its power station. Coal will originate along the Santa Fe main line and will be delivered to the generating station where the "automatic" locomotive will take over.

The 92-ton, all-welded cars have 75-deg slope sheets for free flow of the lading. Each car has six air-operated, longitudinal dump doors, three on each side of the center sill. They can be opened in 6 sec and closed in 12 sec. Each of the three Chicago Pneumatic air motors operates two sets of the doors. All three motors can be controlled by either of two operating valves located at diagonal corners of the car. Door operating mechanisms, with exception of air motors, were supplied by Enterprise.

The locomotive will be operated from a special, remotely located control console. Signals from the control will cause the locomotive to move a string of the loaded cars to a dumping pit and will initiate a brake application when the first car is spotted over the pit.

Unloading will then be started. First step is to throw a safety latch which locks the four-way pneumatic operating valve. The valve handle is then moved to *Unload* position from *Neutral*. When the coal has been discharged, the handle is moved to *Close Door* position and, a few seconds later, to *Neutral*. The safety latch is

then thrown to secure valve handle in neutral position. This safety latch eliminates any possibility of accidental dumping of loaded cars. A separate air line from the locomotive feeds a special reservoir on each car and, through it, the air motors which operate the doors.

When the first car is empty, brakes on the cars and locomotive will be released, and the train will be advanced to place the second car over the pit. The remote control package installed on the locomotive is furnished by Union Switch & Signal.

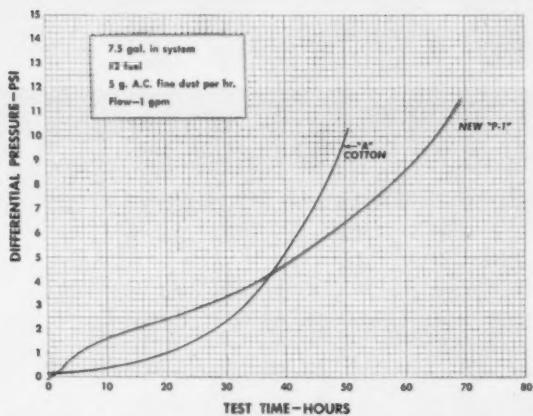
Cars are designed specifically for the special coal service with its high-speed dumping operation. Inside body length is 39 ft 9 in.; inside width, 9 ft 59 $\frac{1}{2}$ in. Height from the bottom of door opening to top of side angle is 10 ft 5 in. and height from top of rail to top of top side angle is 11 ft 10 $\frac{1}{2}$ in. Length over strikers is 56 ft 11 in. Car wheel base is 52 ft 10 in. Capacity is 3,588 cu ft.

The Z-26, 41.2-lb center-sill sections, the side sheets, and the door pans are all low-alloy, high-tensile steel. Side sills are 10-in., 28.5-lb channels. There are twelve 20-in. x 10-ft discharge openings arranged in pairs. The car is equipped with friction draft gears in 25-in. pockets.

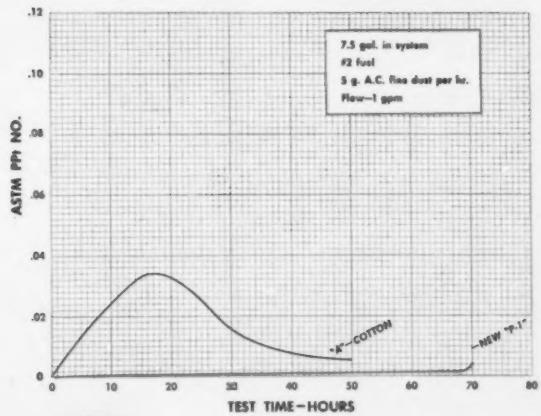
Trucks are ASF A-3 Ride Control with 2 $\frac{1}{2}$ -in. travel springs, 6 $\frac{1}{2}$ x 12 axles, and 36-in. multiple-wear, wrought-steel wheels. Unit brake beams, Atlas lubricator pads and DO journal stops are used. Other equipment includes Westinghouse air brakes, Champion - Peacock hand brakes, and SAB slack adjusters.

Applied Research in Filtration Saves Money for Railroads, too!

NEW CLEANLINESS IN FUEL AND LUBRICATING OILS EFFECTS MAJOR ECONOMIES IN DIESEL OPERATION



Test to demonstrate the comparative efficiency (retention of contaminants) and flow characteristics (pressure drop) of standard 2nd stage fuel filter cartridge "A" versus the new WIX P-1 pleated paper cartridge. With a condemnation limit of 10 psi, cartridge "A" indicates on the chart above a life cycle of 50 hours versus 66 hours for the new WIX development. Note that, throughout its longer service life, the WIX cartridge never exceeds trace amounts as opposed to the performance of cartridge "A" as shown on chart below.



Shown at the left—WIXITE Primary Fuel Filter Cartridge. At the right—the New WIX P-1 Second Stage Fuel Filter Cartridge whose outstanding performance is pictured above.

When a few specks, no larger than the point of a pin, can disrupt the entire schedule of a railroad system, the economic importance of clean fuel oil is well illustrated—but, in only one of its aspects. Engine trouble, caused by fuel failure, is a catastrophe. The day in and day out erosion of vital engine parts, which is the progressive penalty of contaminants in lubricating oil, may be equally costly. Combined, these problems represent significant sums in the annual operations budget.

Research and development by WIX, based on years of study, have made marked progress in the areas of both fuel and lubricating oil filtration. WIX Filter Cartridges were the first to supplant the old hand-filled waste packed filters which today are pretty generally recognized as "extravagant" economies.

Today WIX offers comprehensive coverage of all oil filtration needs on diesel locomotives... lubrication, primary and secondary stage fuel. This coverage embraces many filtering media so that engineering can prescribe the precise filtering formula to suit the engine and its characteristics as well as the service or environment in which it operates.

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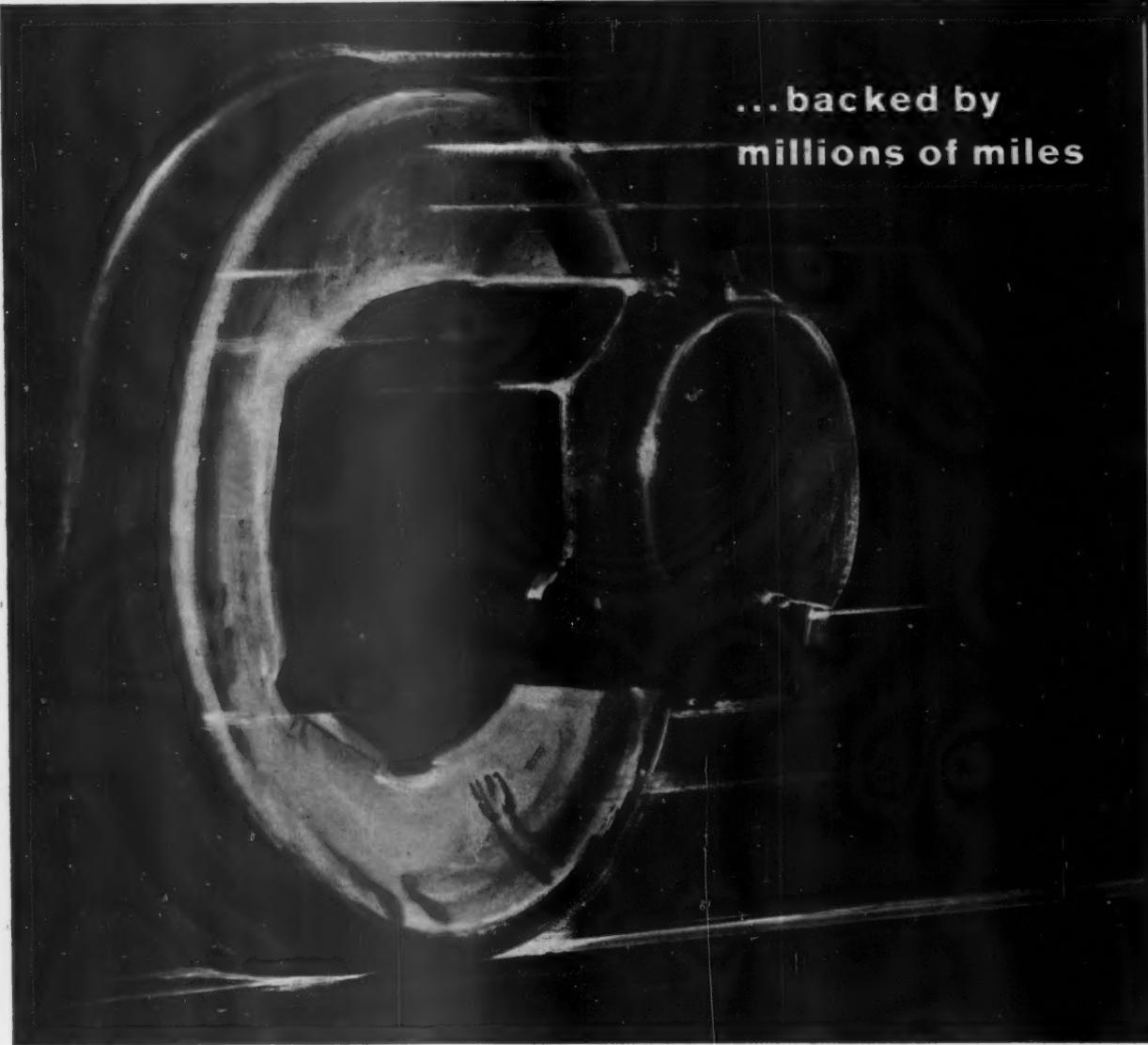
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SINCLAIR L-340 LITHIUM ROLLER BEARING GREASE is a smooth uniform product, manufactured of highly refined mineral oil compounded with lithium soap. • **SINCLAIR L-340** is highly resistant to oxidation, protects against rusting and is non-corrosive to bronze and other bearing metals. • **SINCLAIR L-340** lubricates readily

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of outstanding service

LITHIUM ROLLER BEARING GREASE



at low operating temperatures and will not thin out at high temperatures nor under heavy loads. • **SINCLAIR L-340** has, after millions of miles of service, proved itself outstanding for car and locomotive journal roller bearing lubrication.

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SINCLAIR REFINING COMPANY, RAILWAY SALES • NEW YORK...CHICAGO...HOUSTON

OCTOBER, 1961 • RAILWAY LOCOMOTIVES AND CARS



Vinyl Tubing Protects Insulation

Heat-shrinkable vinyl tubing is being applied by the New York Central as a protection and insulation for the leads and bus bars of locomotive main generators. Applied over the cable insulation on leads and over the tape insulation on bus bars, the vinyl forms a tight protective sleeve to keep conductors moisture free. The vinyl, an electrical insulation in itself, provides added electrical protection as well as moisture protection. Along with excluding moisture, it also prevents the

penetration of oil and grease into the insulation.

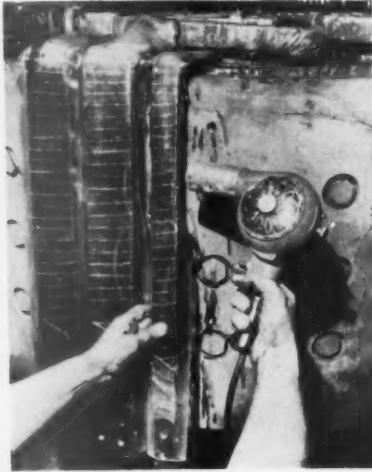
During normal operation and maintenance, water and oils collect in the pans below generators, soaking into insulation. Often in the past, failures in these leads have occurred long before major maintenance was due on the locomotives. The problem was annoying and costly not only because of the labor and shop time required for repairs, but also because of locomotive out-of-service time. In an attempt

to correct the situation, the Central's Collinwood shop, near Cleveland, Ohio, began in 1960 to apply heat shrinkable tubing to all generators coming in for repair.

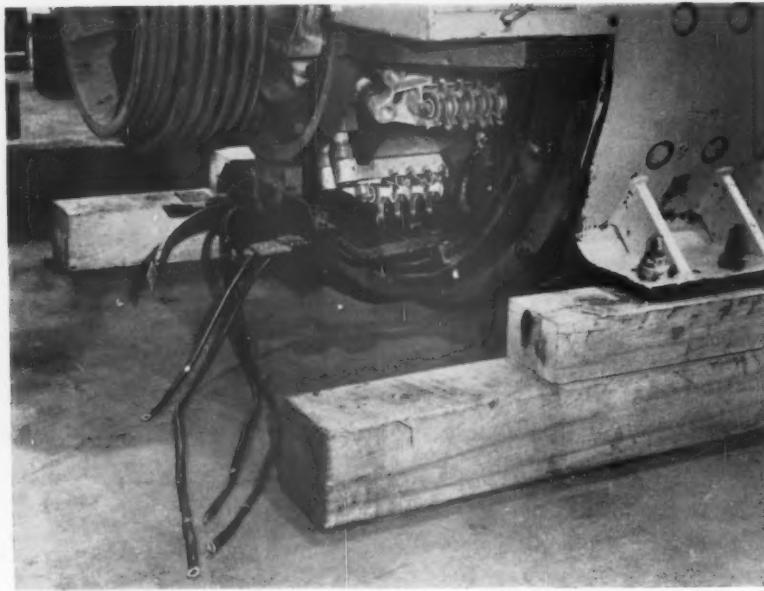
The tubing—Scotchtite brand heat reactive tubing No. 3025, a clear vinyl plastic—is applied wherever possible to leads and bus bars as the first step following reassembly of overhauled generators. Because the tubing is oversize before heat is applied, it can be slipped easily over the cable jackets and bus bar insulation. To further ease application, a dry talc is applied to the flexible leads as a lubricant. The proper size for a snug fit is selected from the various diameters available. Pieces of tubing are cut approximately 1 1/4 in. longer per foot of material required to allow for longitudinal shrinkage.



Vinyl tubing slips easily over the glass tape insulation used on generator bus bars.



Dryer is used for shrinking the tubing in place. Heating is started at attached end of bus bar.



Overhauled generator, with its vinyl-protected leads, is ready to be replaced in locomotive. The conductors have been given added protection against moisture grounds.

Heat Shrinking

With the tubing in place, it is shrunk to fit with a heat gun, starting at the attached end of each lead or bus bar. The tubing can then be shrunk lengthwise onto the cable as the shrinking operation progresses toward the free, or outer, end.

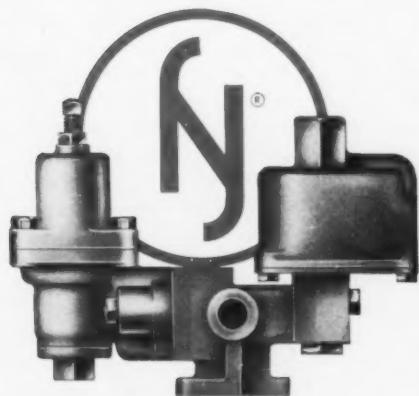
Prior to the varnish dip and baking cycle, the vinyl-covered leads are pulled back and tied in a position where no part of the tubing touches metal parts of the generator. Heat transmitted by contact with metal during baking would otherwise burn and puncture the tubing. The generator is then dipped and baked at 325-335 deg F for a period of 8 hr. After baking, the ends of the tubing are sealed with a liquid neoprene to prevent entry of moisture or oils which could be wicked up by the insulation.

All bus bar and cable clamps are coated with liquid neoprene at the time of installation to form a continuous seal that bridges from the clamps to the vinyl sleeving.

The procedure is presently in use on D-4, D-12, and D-15 generators of EMD freight, passenger, and general purpose diesel locomotives. Preliminary indications show that the added protection provided by heat-shrinkable vinyl will prevent grounding by moisture and oil, helping to reduce locomotive maintenance and out-of-service time.



NOW-Locomotive Wheel Slipping Can Be Controlled!



The Wheel Slip Controller and its associated devices can be applied to all existing air brake systems with the minimum of modification. Write for Circular 103 giving full information and installation diagrams.

The correction of "Wheel Slip" on Diesel-Electric Locomotives has been the subject of continuing study by The New York Air Brake Company. Now, you can have greatly improved locomotive performance and train operation with completely automatic, low cost —

PNEUMATIC WHEEL SLIP CONTROL

The Wheel Slip Controller responds to the existing wheel slip detection relays and within one-half second automatically applies a light brake application to the slipping locomotive unit. This in turn corrects most slips and restores the slipping wheel to train speed without reduction in power.

It comes to you, following thousands of miles of road tests over steep grades and frost-coated rails. In one test run of 1,400 miles it quickly and effectively corrected 95% of the slips with no reduction of power being delivered to the traction motors. Slips were corrected in 1 to 2 seconds from the time of indication. On the 5% not corrected by a pneumatic brake application, the slip was corrected by power reduction in the normal manner.



THE NEW YORK AIR BRAKE COMPANY
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THE MAGNUS METHOD

DRI-
GLIDE

Aerosol*
Replaces
Entire
Luberizing.
Setup!



Leading railroads have given their stamp of approval to this new piston-luberizing method after months of complete tests.

The multiple tanks and drying ovens previously used to luberize overhauled cast iron pistons have been eliminated. A man's full time has been released for more productive work. And, a bottleneck has been eliminated. It used to take 8 hours to luberize 40 pistons; the same amount can now be done in 10 minutes!

Just 15 Seconds Each!

With Magnus Dri-Glide, the machinist turns down the top ring groove, then simply sprays the outside of the piston with Dri-Glide. It's ready for re-use.

*Also available in bulk.

GET THE FACTS about this modern cost-slashing Magnus Method.



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Please send full details on new Magnus Dri-Glide.

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Piggyback Car Has High-Capacity Gears

A multi-purpose 85-ft, 70-ton piggyback car with hydraulic draft gears, has recently been completed by Bethlehem Steel. The prototype, a modification of conventional models, was designed and built to achieve two primary objectives:

- Expand the utility of the typical piggyback car by using "universal" hardware, making possible transport of highway trailers, containers, pallets, or racks interchangeably or in various combinations.
- Utilize the latest in freight-car equipment, such as hydraulic cushioning devices and truck-mounted air brakes.

Built at the Johnstown, Pa., plant, the car can handle three types of lading—container, pallet and trailer—simultaneously and was so loaded when shown at the Allied Railway Supply Association exhibit in Chicago last month.

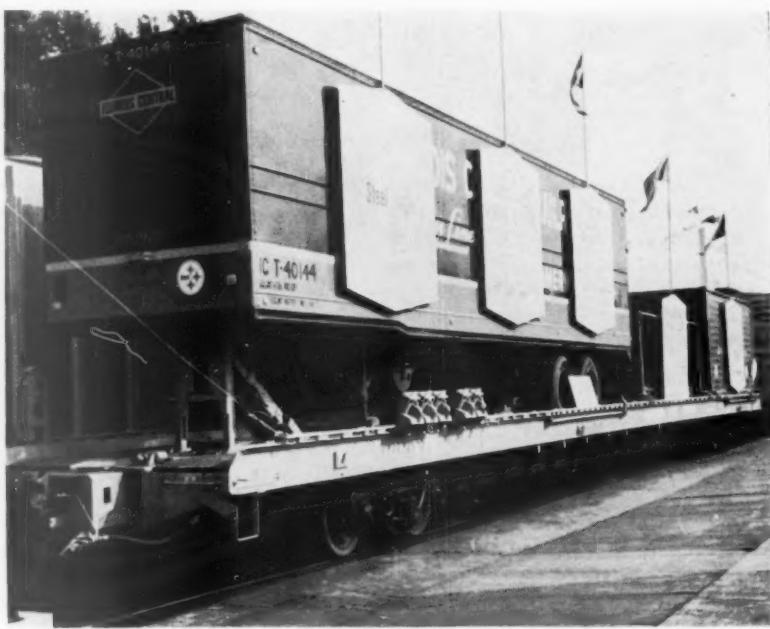
The long-travel, hydraulic and rubber cushioning built into the underframe reduces impact forces imposed on the car and lading, eliminating the need for individual cushioning of trailer hitches, container racks, and automobile racks. Positive anchoring

for all of these major types of shipping units simplifies deck construction, gives greater loading flexibility, and increases lading protection.

National Castings NH-24 draft gears are installed outboard of the bolsters at the ends of the car. These are combination hydraulic and rubber units having 24-in. hydraulic travel, plus 2 in. of rubber-cushioned travel in buff and 2 in. of rubber-cushioned travel in pull, designed specifically for the end-of-car application on long-overhang piggyback cars.

Universal tie-down hardware, also developed by National Castings, has been applied to the prototype piggyback car. These are the devices which make possible the transporting of highway trailers, containers, and auto-racks.

Some structural changes have been made so the prototype differs from the now familiar 85-ft piggyback car. These changes result in some reduction in the weight of the basic underframe structure and simplify the overall design, reducing construction costs. Wabcopak truck-mounted brakes, a recent development of Westinghouse Air Brake Co., are used.

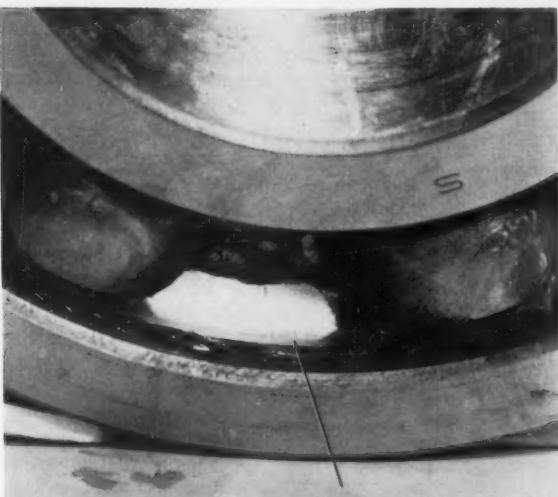


Trailer, rack and container can be handled simultaneously with universal "hardware."

18

Roll Them Out Like New

Motor and Generator Bearings



Electrical pitting is caused by current passing through bearing.



Lubrication failure caused by gear lubricant getting into bearing.

Bearings may seem to be simple machine parts, but they are very important. They are the components which determine whether your rotating equipment rotates. Even though they look so simple, they deserve careful attention and proper care.

Both sleeve and anti-friction bearings are used in rotating electrical equipment for railway applications. Each type of bearing has its place, but in recent years anti-friction bearings have taken over more and more of the jobs.

Sleeve bearings may be either plain or babbitted, with babbitted bearings used where the duty is more severe. Anti-friction bearings used in railway applications may be of different varieties—ball, cylindrical roller, tapered roller, or spherical roller. The electrical equipment manufacturer chooses the bearing best suited to the job, keeping in mind such things as size, assembly, cost, lubrication, speed and capacity. For these reasons manufacturers' recommendations should be carefully followed when replacing bearings.

Generally, the anti-friction bearings

This is the eighteenth article in this series covering heavy maintenance of locomotive electrical equipment. Part 18 was written by C. F. Simon, Jr., Locomotive and Car Equipment Department, General Electric Co., Erie, Pa.

used in railway electrical equipment are different from those used in machines built for other industries. These bearings usually have larger internal clearances than are standard for industrial-type bearings. This allows for the tighter fit on shafts and in housings required on railway equipment because of the shocks and vibration which are encountered in service. Railway-type bearings may also have a better class of cage. Additional, or larger, rollers or balls are sometimes used to give added capacity. These differences are designated by numbers or letters added to the basic catalog number stamped on the bearing. That is why using a substitute bearing which has *almost* the same designation as the original bearing may be dangerous. That extra letter or number missing from the designation of the substitute bearing is often the key to success or failure of the bearing application.

Railway bearings are selected to give long life under severe operating conditions. They are rated by statistical methods so their life expectancy is known. A small percentage will fail early. Many early failures occur in the first few hours of running. If new bearings are installed when a machine is rebuilt, the machine should be

tested before being put into service. A couple of hours of operation in the shop may avoid subsequent disassembly or a road failure.

When a bearing is removed, it should be identified with the machine from which it has been taken. An easy way is to tag the bearing with the machine frame and armature serial numbers. If bearing trouble is discovered later, you can then check back for faulty machine parts that might have caused the trouble.

Lubrication

When a bearing is removed, the grease should be examined. Its appearance and condition will yield information about many things. It will tell whether the seals are adequate to keep dirt out and grease in; whether the operating temperatures of the grease has been excessive; whether the grease is providing lubrication to the bearings, and whether the interval between overhauls is too long or too short for the grease used. The same observations apply to the oil in oil-lubricated bearings. This may appear to be useless if you always seem to find everything all right. *But keep on looking;* some day a slight difference may show up during overhauls that

will be a timely warning of impending trouble.

Bearings may be lubricated either with grease or oil. Oil does a good lubricating job over a range of conditions, but sealing is a problem which can involve extra servicing and increased cost. Although grease is much easier to handle and is preferred by maintenance people, it does have definite speed limitations.

Based on his experience, the equipment manufacturer recommends the best lubricant for an application. While other lubricants may be suitable, go carefully in making any substitution. There are various tests to tell if greases which are called equivalent actually do meet the same specification. Two greases, equally good for a job, might not meet the same specification, or greases meeting the same specification might not give equal performance in service. It's a good idea to be cautious about adopting new lubricants. Make service tests with a small number of machines before changing over a large locomotive fleet.

Two things frequently happen to oil-lubricated bearings. Dirt may get in, causing wear, or water may collect in the bottom of the reservoir, with the risk of inadequate lubrication. Drain and flush the reservoirs of oil-lubricated bearings periodically.

There is a common idea that you can't use too much grease in grease-lubricated bearings. This results in the habit of giving a bearing an extra "shot" of grease for good measure. Too much grease can lead to overheating and failure. Seals in the housing prevent excess grease from leaking out; it has to churn until it gets hot enough to melt before the excess can escape. By then the overheated bearing may fail. If this does not happen, the grease may be permanently damaged so its lubrication life is greatly shortened.

Inspection

When a bearing is removed, it must be cleaned and examined to decide whether it is reusable. This should be done even if a bearing has failed. Inspection often tells why. If there are a series of similar bearing failures, an expert can be called in to pinpoint the cause.

Bearing work should be separated from the regular shop work. This will prevent mishandling of bearings and protect them from the dirt found in open shop areas. A small room, located on the repair floor, can provide a clean working atmosphere.

Many solvents may be used for cleaning bearings and they can be rinsed, soaked, sprayed, or cleaned

sonically. Care should be taken to select a solvent which will not attack the bearing itself. Some anti-friction bearings now have non-metallic parts. If you are cleaning any of these, be sure the solvent will not harm them. Do not use solvents that leave a dirty residue and filter all solvents before reuse.

Once cleaned, bearings should be protected from dirt, humidity, and improper handling. This is best done by coating them with light oil and wrapping them in a material that does not absorb moisture. Bearings which can be reused or repaired should be cleaned, wrapped, and stored as soon as possible after removal from the machine.

What should be done with bearings from a machine which has been disassembled for some reason other than bearing trouble? It is most practical to examine the bearings carefully and reuse them whenever possible. In addition to the dollar savings, any bearing that has operated successfully might be preferable to a new bearing which could have unknown flaws.

Some manufacturers mark a series of numbers on the bearing race. When the bearing is reapplied after overhaul, the race can be rotated to put a different number in the load zone. Rotating the race brings a new part into the load zone, giving maximum fatigue life.

Anti-Friction Failures

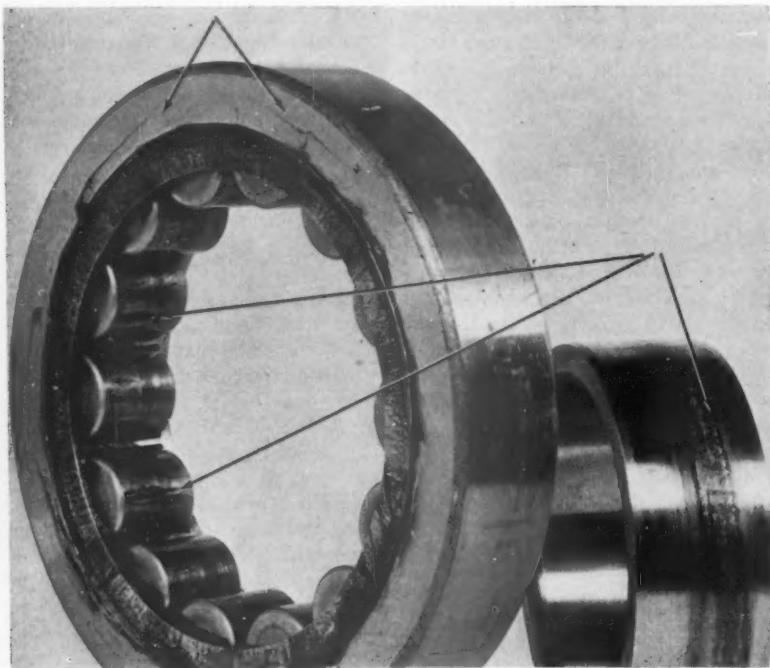
If run to the end of their life, anti-friction bearings will normally fail by fatigue. The trouble usually occurs in one of the races and is identified by little pieces of metal which fall out of the race. As the fatigue failure progresses, large areas of the race fall out and eventually the bearing will destroy itself.

Anti-friction bearings may also fail in other ways, such as by:

Electrical pitting caused by current passing through the bearing. If examined under a magnifying glass, the bearing shows small pits having the appearance of tiny craters. These craters tend to produce early fatigue failure.

Smearing caused by rollers skidding on the races. This tends to produce flat spots so that the parts look as if the rolling element had slid over the surface.

Cracks caused by various conditions, such as flaws in the metal, over-



Roller bearing shows heat cracks in outer race and skidding of the rollers on inner race.

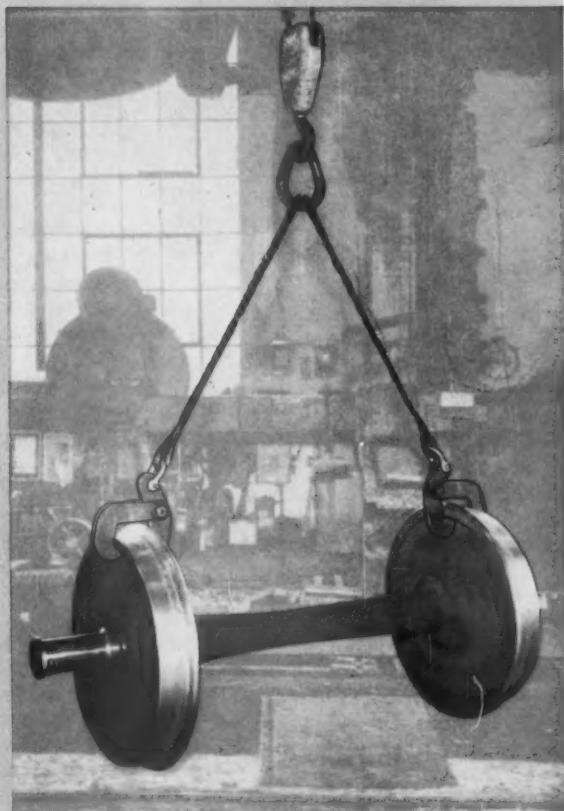
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Close-up shows specially designed Yellow Strand hook. It clasps or unclasps easily and cannot slip during lift. Fits all wheels.



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heating, and too tight a bearing fit.

Prelading resulting in binding of the rolling elements between the races when the bearing is assembled. If the binding is not excessive, it may do no harm. If a temperature difference develops between the inner and outer races during operation, the binding may become excessive. This condition can be identified by wear patterns which will be evident entirely around the circumference of both races.

Misalignment caused by inner and outer races being tilted with respect to one another. It can be identified by a wear pattern in the race crossing from one side to the other.

Staining, not necessarily a sign of trouble, may be caused by chemical action between the grease and the bearing materials. It may also be an indication that the bearing has been running at high temperature. If such is the cause, there will probably be other signs of trouble, such as poor lubrication.

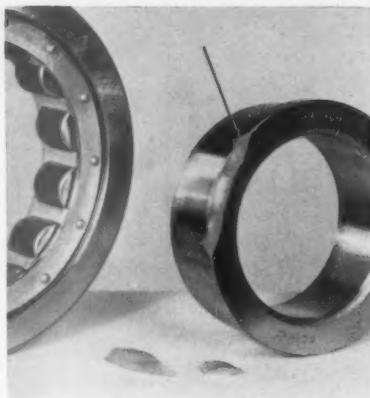
Brinelling, caused by the rolling elements pressing too hard on the races while the bearing is stationary, is identified by indentations in the races having the same spacing as the rolling elements. It is frequently caused by driving the bearing on or off the shaft. Good shop practices and use of proper tools will usually avoid brinelling.

False brinelling. Looks almost like brinelling at first glance, but is more difficult to cure. It is caused by vibration of the machine when it is not rotating. The rolling elements actually wear holes in the races. Two possible cures are to stop the vibration, or to keep the machine rotating at all times.

Slippage of races caused by poor fits in housing or on the shaft. Slipping is bad because it may generate excessive heat. If allowed to continue, it will eventually wear the shaft or housing enough to cause a machine failure. Slipping can usually be identified by scoring marks on the race exteriors.

Dirt indenting caused by a foreign material getting into the bearing. It gives a pox-like appearance to the races, and it will lead to early bearing failures. Proper care in handling and lubricating bearings will go a long way toward keeping foreign material out.

Broken flanges caused by flaws in the bearing, excessive heat, or high thrust loads. A careful study of the failed part will usually give clues as to the cause of the trouble.



Broken inner race, probably caused by flaws in the metal, was discovered during inspection.

Loose rivets on cages caused frequently by excessive vibration, or by skewing of the cage so it carries load.

Worn cages caused usually by improper lubrication. The cage is usually the first component to give evidence of poor lubrication, because it is subjected to sliding rather than rolling action.

Wear caused by poor lubrication. Under some conditions, the bearing is expected to fail by wear rather than by fatigue. A good example is a bearing working in an abrasive atmosphere where the lubricant cannot be kept clean. Failure of pinion end traction motor bearings may be caused by migration of the gear lubricant through the seal into the bearing chamber. Here it contaminates the bearing lubricant and causes wear. This trouble often results from overfilling the gear case.

Sleeve-Bearing Failures

A sleeve bearing usually fails from wear. The journal gradually wears the bearing until it becomes too sloppy on the shaft, or too thin to carry the load. Other causes of failures are:

Scoring, a series of circumferential scratches on the bearing surface caused by a rough journal or by dirt in the bearing.

Loose babbitt, sometimes caused by poor bonding in original manufacture. It may also result from a crack in the babbitt. This allows oil to get into the bond area and build up sufficient hydraulic pressure to break the babbitt away from the backing.

Wiping, which appears in many bearings to some degree, usually takes place when a new bearing is adjusting to the journal. Excessive wiping may

indicate inadequate lubrication or an overloaded bearing. Poor journal finish can also cause excessive wiping.

Misalignment, identified by wear on diagonally opposite edges of the bearing. It will lead to early failure, because the load is highly concentrated.

Electrical pitting. Sleeve bearings take on a satin appearance with small pits when they carry electric current. If excessive, this leads to shortened life.

Overheating, frequently identified by discoloration of hot areas, is often caused by localized loading or insufficient lubrication.

Cracks, often caused by localized "pinching" of the bearing, or by loads concentrated on point areas. If cracks occur, it is well to check the bearing support, because the trouble may be there.

What About Salvage?

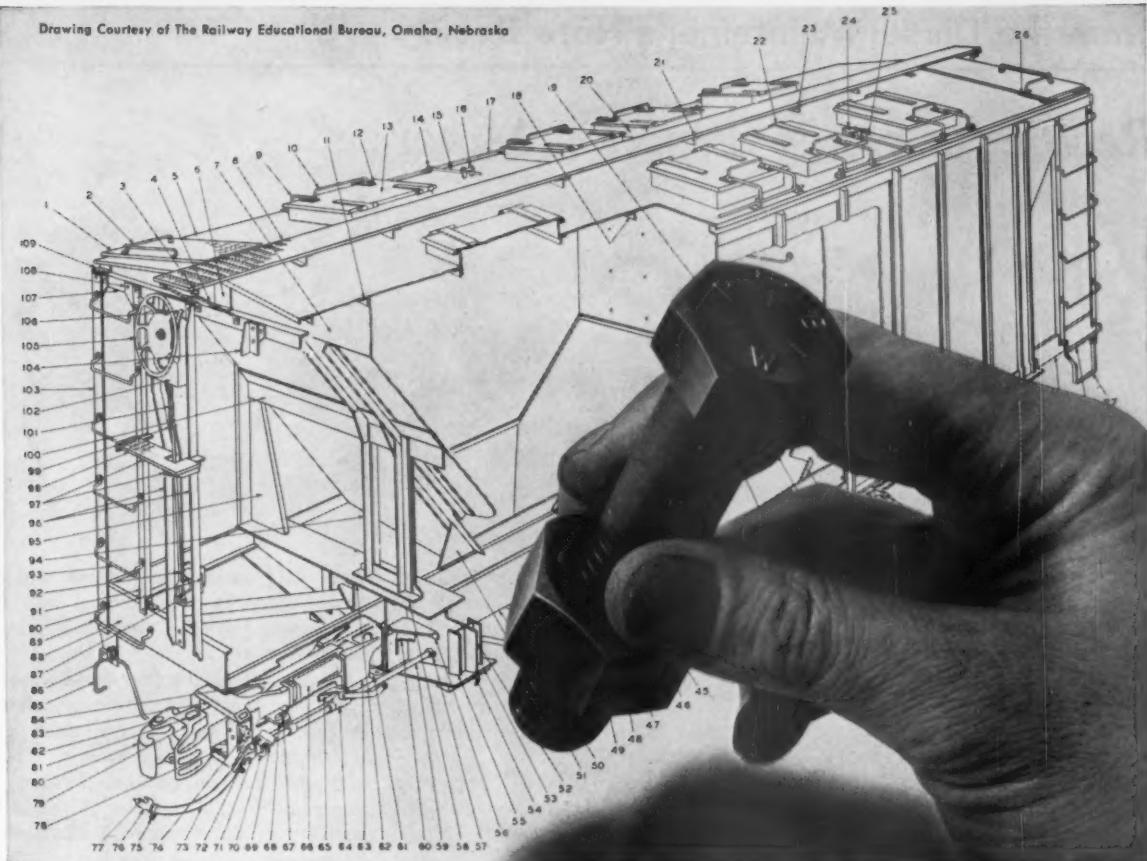
Babbitted sleeve bearings can be re-babbited when worn out. The metal in unbabbitted bearings has a salvage value. Many vendors allow credit for the return of worn sleeve bearings.

The case for anti-friction bearings is different. Some cost so little that it is cheaper to replace them than to attempt salvage. Others cost so much that they are well worth salvaging if possible. Some manufacturers will take bearings which have minor troubles and recondition them. Such reconditioned bearings are considered as good as new, and this service offers definite economies.

Doubtful bearings should not be reused. The money saved will seldom warrant the risk of an equipment failure. How many times and how long a bearing can be used it is difficult to say. Any answer must be based on experience with the equipment. This experience can be of benefit only if adequate records are kept. The date and cause of each failure should be recorded. Such records may show that a particular trouble is being experienced, or that certain machines are giving trouble. This information helps solve the problems quickly, thus saving untold cost. If the same trouble is occurring repeatedly, it may be wise to consult the manufacturers. Their experience on other applications may lead to quick solutions.

In conclusion, the keys to keeping bearing troubles under control are regular and systematic checks, careful observations, and accurate records.

Drawing Courtesy of The Railway Educational Bureau, Omaha, Nebraska



Where would you use high strength bolts to construct a permanently-tight hopper car?

Wherever you have a problem joint—wherever shock, vibration and impact under high loads so often cause rivets to loosen or fail—that's where RB&W High Strength Bolts belong.

Unlike rivets, high strength bolts stay tight, exert over twice as much force on a joint. In fact, clamping strength is so great that the resultant frictional force between bolted members—not just the shear strength of the fastener as with a rivet—helps keep the joint from failing under rough service.

RB&W's High Strength Bolts are easy to install in new cars or cars being rebuilt, particularly where quarters are cramped. Instead of four-man riveting crews, two men—sometimes only one—can do the job. This reduces assembly costs. Saves time and money on future maintenance, too; keeps rolling stock in service longer, instead of being returned to the shop for repairs.

When rivets fail, trouble begins. Save yourself needless costs by calling in an RB&W engineer to show

you exactly where to use high strength bolts in a hopper car...or any other freight car, for that matter. Bulletin RR-3 tells more. Write Russell, Burdsall & Ward Bolt and Nut Company, Port Chester, New York.



Plants at: Port Chester, N. Y.; Corapolis, Pa.; Rock Falls, Ill.; Los Angeles, Calif. Additional sales offices at: Ardmore (Phila.), Pa.; Pittsburgh; Detroit; Chicago; Dallas; San Francisco.

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Recipe for Roast Traction Motor

By Gordon Taylor

"Doc" Watts, the electrical foreman, was walking through the Centerville diesel shop when he was stopped by Fred Newman, an apprentice. "Mr. Watts," Fred said, "I have a question that's been bothering me. If you have the time, I'd like some information."

"What's your trouble?" asked Doc.

"Cable connections on traction motors," Fred answered. "We were putting a new truck under unit 1240. The man I was helping said we must be sure to check the rotation of each motor under power to be certain it operated properly in both directions. I then asked him why, if it worked OK in one direction, wouldn't it also work OK in the opposite direction when the reverser was thrown.

"He told me that, if certain cables were connected, the motor might rotate properly in one direction, but wouldn't operate properly in the opposite direction. He didn't make it clear to me what these wrong connections would be and didn't show me just what interfered with proper motor operation. I'd sure appreciate it if you would straighten me out."

"I'll be glad to explain," said Doc. "First, let's consider what gives a motor the ability to develop power. Rotation of a motor is due to the reaction between the current flowing in the armature coils and a magnetic field in which the armature coils rotate. The motor's torque or turning power is proportional to the current in the armature times the field strength. There must be a proper armature circuit and a proper field circuit before the motor will work. Field and armature circuits of traction motors are connected in series. By changing the direction of current flow in the fields,

we change the direction of rotation. It would do no good to change the flow of current through both the field and armature circuits. To change the direction of rotation, we must change the relation between the field set up by the armature coils and the field set up by the field coils.

We must reverse the flow of current through the field coils when we want to reverse the rotation of a motor. Interchanging a motor's field and armature cable connections could make the motor operate correctly in one direction but not in the other.

"If you will check the wiring diagram for one of these units, you'll find that throwing the reverser can cut the motor field out of the circuit if a field and an armature lead had been interchanged. The motor could then operate correctly in one direction but not in the other. If a unit were put into service without checking rotation of individual motors, the condition might continue for some time before being detected. In that case, you'd probably have a badly damaged motor."

"What," asked Fred, "would damage the motor? If it wouldn't work properly in one direction, then it surely wouldn't be overloaded when the unit was operating that way."

"Good question," said Doc, "I'll be glad to clear it up for you. Motor heating depends on the current flowing through it. Heating effect rises rapidly when current goes up. Heat increases as the square of the current. If you double the amperes, the heating effect is not doubled but increased by four times (two times two). Consequently, current flow must be limited

to a value which will allow motor temperature to be controlled by the ventilation provided by the traction motor blower.

"Fortunately, traction motors have what you might call a 'built-in' safety feature that limits current when all circuit connections are proper. This is the counter emf, or counter voltage, generated by the motor. At the last meeting of the apprentice class, we found that counter voltage is generated when any conductor cuts magnetic flux. This is just as true of the conductors of an armature when it is running in a motor as when it is operating in a generator. In both cases, the armature conductors are rotating in, or cutting through, a magnetic field.

"The conductor voltage induced in a motor armature is in a direction opposed to, but always less than, the voltage applied to the motor. Any motor tries to protect itself from excess current by generating a counter voltage.

"Let's consider a traction motor that has had the field and armature leads interchanged. When the reverser moves to the position that cuts the motor field circuit, it still maintains a circuit through the armature. This places the armature in the circuit from the main generator, but the only excitation is that resulting from a weak residual field in the field poles. This leaves the armature helpless to operate as a motor armature should and incapable of generating a counter voltage that would limit the current from the generator. The only limit to current flow through the armature would

(Continued on page 43)

This series of articles is based on actual experiences of men who operate and maintain diesel-electric locomotives.



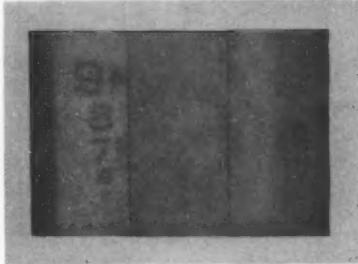


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HIGH GLOSS. Initial gloss superiority of TUFF Fast-Dry Enamel (left panel) is shown in this Kerr Definometer Reflectance test. Middle panel is coated with a well-known enamel, right panel with a leading lacquer.

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TUFF gives 800 square feet coverage per gallon, more than that of leading competitive epoxy systems. Mixing and using TUFF is easier, too, thanks to tolerant component ratios (1:1 or 2:1) and long pot life (16-48 hours). Painters say TUFF Epoxy is as easy to apply as conventional one-component paint.

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Passenger Diesel Now Hauls Freight

What has been called the first successful conversion of an EMD road passenger locomotive for freight service by a U.S. railroad has been completed at the Northern Maine Junction shop of the Bangor & Aroostook. Locomotive 10, a 2,000-hp EA-7 purchased in 1949, was altered so that its performance is compatible with that of the F-3 road freight units of the BAR. All work was done by the railroad with engineers from the Electro-Motive of General Motors as consultants.

The BAR claims this to be "the biggest bargain of the year." It has acquired, the road says, the equivalent of a \$200,000 unit. "We were able to convert a locomotive," W. J. Strout, executive vice-president said, "that might have been worth \$18,000 to \$20,000 on a trade toward a new \$200,000 freight locomotive, for under \$10,000. Our one remaining passenger locomotive will be converted as soon as possible."

Two years ago Railway Locomotives and Cars surveyed 34 roads operating 2,000-hp, 2,250-hp, and 2,400-hp road passenger locomotives,

asking what could be done with these big locomotives if there was no passenger trains for them to haul. This survey (RL&C, September 1959, p 44) indicated that 13 roads would assign the units to freight service in their original condition; four would do it only if gear ratios could be changed, and seven said that they would not be used in freight service.

Problems

The problems involved were:

- High horsepower rating per driving axle;
- Sacrifice of adhesive weight because of the two idler axles;
- Continuous rating at speeds higher than practicable for freight service;
- Impossibility of re-gearing to drop continuous speed into range of many road freight units;
- Absence of automatic backward transition on some units.

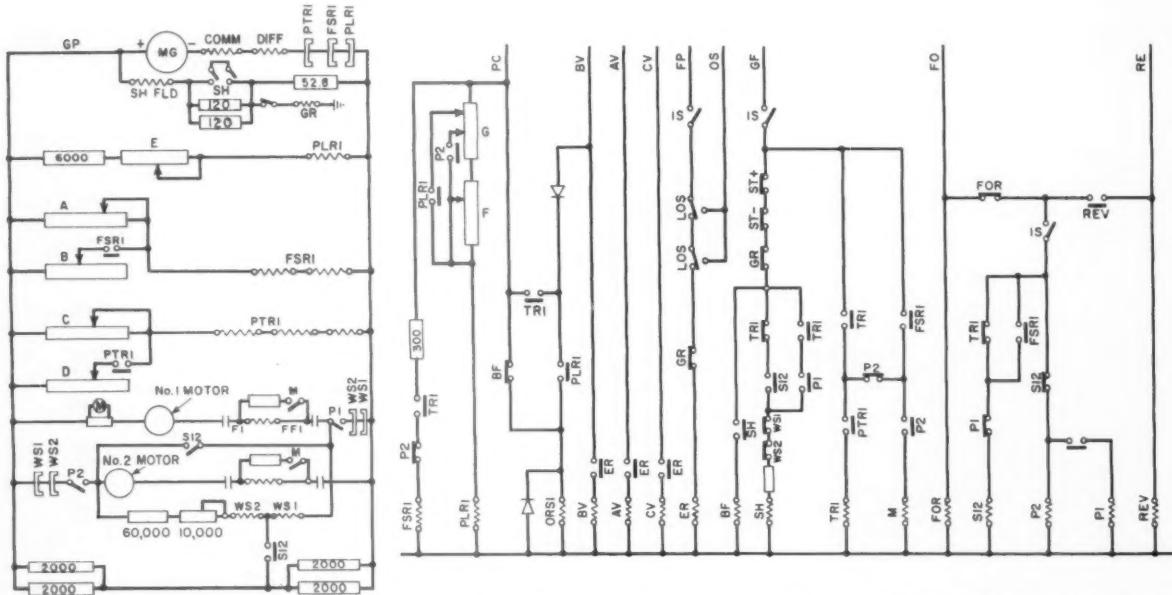
"To put the continuous rating into the range where passenger units could be utilized effectively in freight service without new trucks and additional

motors is difficult," the article continued. "Here the EMD units present special problems. While 40-in. driving wheels have been standard on Alco, Baldwin, and Fairbanks-Morse passenger locomotives, all Electro-Motive E-type units have 36-in. wheels. This limits the size of driving gear which can be applied."

About the time this article appeared the BAR began to concentrate on the conversion problem. Passenger losses had forced curtailment of train service so that one of its two expensive passenger units was not being utilized, except as work train motive power, during two or three months of the year.

"What we wanted," said Mr. Strout, "was to convert this engine for all-around freight service so that it could be used interchangeably with the rest of our motive power. We were told that the conversion had never been successfully made and that the unit couldn't be used with conventional freight locomotives in multiple-unit operation."

Mr. Strout, together with Mechanical Superintendent V. L. Ladd, talked with other railroads that had surplus



Control conversion for the transmission for one of the two 1,000-hp engines on an E7 includes power limit and EI transition. Variable resistor values and settings are as follows: A—15,000 ohm, 0.078 amp at 980 volts; B—20,000 ohm, 0.088 amp at 670 volts; C—20,000 ohm,

0.063 amp at 980 volts; D—10,000 ohm, 0.085 amp at 450 volts; E—6,000 ohm, 0.129 amp at 980 volts; F—1,500 ohm, 0.033 amp at 74 volts; G—1,500 ohm, 0.090 amp through P2 interlock at 74 volts, and 0.0150 amp through PLRI interlock at 74 volts.

E units and then to engineers at EMD where the locomotives had been built. Some roads were scrapping their passenger units; others were trading them in on new freight locomotives.

In April 1961 the decision was made to attempt the conversion of Locomotive 10 despite advice of others who had tried it. At Mr. Strout's request, EMD sent a team of engineers to the Northern Maine Junction where the work was scheduled to be done.

The basic problem in the conversion is that a passenger locomotive has continuous and maximum speeds higher than those of freight units. This problem was solved by changing the gear ratio from the original 57/20 to 62/15 which corresponds to that of BAR freight power. This made it necessary to install larger wheels on

the locomotive. Increasing wheel diameter from 36 to 38 in. gave sufficient over-the-rail clearance for the 62-tooth gears. The 40-in. wheels, standard on freight units, could not be used because they made too great a change in locomotive height. All wheels, including those on the center idler axles were changed. Truck brake rods were lengthened to compensate for the change in wheel size and the coupler height was adjusted to compensate for the change in truck height. The steam generator, no longer needed, was removed, and the unit was ballasted to compensate for the material removed. Cab heaters were repiped so that, instead of steam, they used cooling water from the No. 1 engine.

The electrical controls were modified to give automatic voltage—current transition down to 10 mph in-

stead of 19 mph. Engine output is controlled by the transition relay hook-up and the load regulator. Output is regulated so that it is in the 1,500-hp range at speeds up to 25 mph. Above that speed, the output is allowed to rise to the locomotive's rated 2,000 hp.

On July 11, the locomotive made its first trip in freight service. EMD engineers rode the unit along with BAR mechanical officers. They found the converted locomotive an unqualified success. It proved to be fully compatible with BAR freight units.

On September 2, the BAR ceased all of its rail passenger service and shortly thereafter announced its plans for conversion of Locomotive 11, so it can take its place in the regular road freight locomotive pool along with Locomotive 10.

Roast Traction Motor

(Continued from page 40)

be resistance of the armature coils. The resistance is so very low that this armature would form practically a short circuit across the power circuits. Excessively high current through the armature would damage it, giving us a thoroughly roasted traction motor. You must always remember how important it is to check traction motor rotation in both directions any time motor leads are being connected."

"What's a quick, reliable method for doing it?" asked Fred.

"I'm sure you have observed the three-point suspension of traction motors in trucks," Doc replied. "Two points are the two axle suspension bearings and the third is the nose suspension. Each time power is applied to the traction motors, the pinion of each motor tries to ride around the axle driving gear, raising the motor up or pulling it down, depending on its rotation. Movement of the motor is arrested by the nose suspension—those heavy lugs on the motor frame that contact the top and bottom of a nest of springs fastened to the truck frame bolster.

"To check the direction of motor rotation, observe the movement of the nose suspension when power is applied. A motor which is connected backwards can be readily detected. Remember to check each motor with the reverser set for both directions of

travel. Checking the rotation in just one direction does not give you the complete story.

"Direction of motor rotation on passenger-type locomotives may be easily checked by operating one power plant at a time, applying power to the truck to be tested. If one of these two motors is connected wrong, the locomotive will not move. This same method may be used on switcher locomotives by isolating one truck at a time, using the motor cut-out switch for that purpose.

"There is another special situation which we should consider. Suppose the individual axles do not revolve in the same direction for a given position of the reverse lever, even though it is evident that all motors do develop power in both directions. This indicates that field or armature leads of one of the motors are reversed and differ from the first case in which field and armature leads were interchanged.

"To correct this trouble, be sure that the change is made at the correct point; don't reverse the armature leads when the field leads should have been changed or vice versa. Reversing the wrong leads may correct the immediate difficulty, but not cure the trouble permanently. It would also make the wiring different from the diagram, leading to more difficulties. You should check the wiring diagram for that locomotive and only then change the leads.

"Remember that when a motor op-

erates a unit correctly in one direction, although drawing excessive current, it has an armature and a field lead interchanged," concluded Doc.

"Did you ever have a case where a traction motor was ruined by being put in service with interchanged field and armature leads?" asked Fred.

"Never on a unit dispatched from this shop," said Doc proudly. "We did have a case several years ago. A unit came in from one of the smaller points with such a motor. The shop there installed its spare truck on the unit. Everyone was hurrying to release the locomotive. An acting foreman, in charge of the work, was not accustomed to the pressure that prevails at such a time. He yielded to the criticism of the yardmaster who was trying to speed the train's departure. The foreman knew that both motors should be tested for rotation in both directions, but when the last motor was connected and operated properly in one direction, he said, 'Take it; it's OK.' By the time that unit reached us here at Centerville, that motor was as hot as Custer's pistol. We had roasted traction motor on our menu for that day. It's a dish that you never acquire a taste for. It was a bad dish for that foreman. Having demonstrated that he would weaken under pressure and could endanger expensive equipment, it was two or three years before he again had the opportunity to demonstrate that he could supervise at one of our shops."

Journal Problems

(Continued from page 20)

porting methods in order that a definite cost analysis might be developed.

Lubrication periods on roller bearings have been extended from 18 months to 24 and 36 months, depending on the type of bearing. A large number of cars now on test seem to indicate further extensions will be possible.

The stabilized solid journal assembly and sealed journal box comprise the simplest method for achieving a four-year repack period, the Committee reported. The arrangement also offers an opportunity to reduce the number of servicing points and to reduce consumption of oil, journal bearings, and lubricating devices.

There are a number of rear seals available, but their effectiveness depends on controlled axle movement. The two generally accepted methods for controlling axle movement are journal stops and flat-back bearings. Both have proved that they will perform satisfactorily.

Several low-cost stops are now on test, but results are not conclusive. According to the Committee, journal stops which have been in service for a number of years have proved their effectiveness in protecting the rear seal, prolonging journal bearing life, and providing better performance.

The flat-back bearing is easier to install than most journal stops. The special wedge which it requires can now be purchased for less than the standard wedge. A number

of cars with flat-back bearings and front and rear seals have been on test for over three years, and the results have been excellent.

While many railroads were slow to apply lubricating devices, they are now moving rather rapidly to take advantage of the economies which are possible. In 1960, many servicing points were eliminated and roads now operate trains from 400 to 1,200 miles without inspecting the journal boxes. A large number of roads now use seasonal oil to facilitate wicking in winter because wicking characteristics of lubricating devices decrease as the temperature drops. Many are also using premium or additive journal box oils which are reported to have a much greater load carrying ability, lower friction characteristic, greater protection under marginal conditions, and better rust inhibiting qualities.

While it is difficult to assemble enough field data to produce agreement as to the value of these oils, many roads with system car mileage constituting a substantial portion of their total car-miles say these oils have proved themselves.

The AAR requirement of adding sufficient oil to bring the level up to $\frac{1}{2}$ in. in the journal box is producing good results. When all journal boxes are equipped with seals, automated hump oiling systems will probably replace the can method.

A major cause for improper functioning of a lubricating device is moisture, the Committee said. Water in journal boxes is one of the chief causes of hot boxes; it also shortens the life of lubricating devices. It is most serious on tank and refrigerator

cars. In many cases, cars with water in boxes are taken to the shop tracks where they receive the same attention as if being repacked according to Rule 66, but no charge is allowed for this work. It was proposed that the AAR consider an addition to Rule 66 allowing repacking of tank and refrigerator cars on a 6, 12, and 18 month basis, with the delivering or handling line sharing the cost with the car owner.

Center Plate Lubrication

Irregularities between center-plate faces result in small contact areas with high loads which restrict proper swiveling of freight-car trucks. This condition results in uneven journal loading and causes flange wear. Lubrication has been ineffective, because the lubricant was forced out or solidified.

Experiments with various lubricants have not met with complete success. Machining center-plate surfaces and applying molybdenum disulfide powder with an evaporating agent, or in the form of molded plastic discs, initially gave encouraging results. The molybdenum disulfide did not last too long, but did produce a better surface condition for ordinary lubricants. Tests are also being conducted with hardened metal discs separating the softer center plate surfaces. Some of these discs have holes in them to retain the lubricant. If tests do not yield satisfactory results, some thought will probably be given to redesigning the center bearing so it will retain the lubricant, or to the use of smooth plastic materials on these wear surfaces.

What's New

(Continued from page 10)



the drawings is transferred to paper tape by means of an automatic punch typewriter. The tape provides the input data to the cutting machine. After initial positioning by an operator, all operations are fully automatic. Auxiliary functions, such as starting and stopping the machine, igniting of preheat flames, flame control, gas supply control and cut sequence, are also programmed on the tape. Cutting speeds, also controlled by the tape, can be programmed within the limits of 2 ipm to 35 ipm. A fast traverse speed for positioning the machine between cuts may be programmed on the tape up to 150 ipm. The unit has four cutting torches with an accuracy of (plus or minus) $\frac{1}{64}$ in. Air Reduction Sales Co., a division of Air Reduction Co., Dept. RLC, 150 E. 42nd st., New York 17, N.Y.

All-Steel Center Flow Car

An all-steel version of the Center Flow high-capacity covered hopper, the tubular body of which serves as the center sill (RL&C, June 1961, p 33), is now being built and sold to the railroads by ACF and leased to industrial users by ACF's Shippers Car Line Division. Aluminum cars are also in production. Center line placement of loading hatches and unloading gates speeds the flow of lading in and out of the Center Flow car, and its four inverted-pea shape compartments permit more than one commodity at a time to be shipped. American Car & Foundry Div., ACF Industries, Inc., Dept. RLC, 750 Third ave., New York 17.



Rubber Base Sealers

The cross-sectional "double donut" design of the hollow EC-2121 sealer (left) and the EC-2131 solid sealer (right) is said to permit positive sealing of uneven or tapered joints, and 90-deg bending without cutting or fitting operations. Light hand pressure seals mating metal surfaces. Minnesota Mining & Manufacturing Co., Dept. RLC, 900 Bush ave., St. Paul, Minn.



Boring Bars

The five small boring bars in the BB-7500 series have the same diameters but are shorter in length than the series BB-7000 K-bars. The BB-7500's are primarily for jig boring machines and similar applications where utmost rigidity is required for close tolerance boring and best possible finish. Bar diameters are $\frac{3}{8}$, $\frac{1}{2}$, $\frac{5}{8}$, $\frac{3}{4}$, and 1 in., with respective lengths of 4, 5, 6, 7, and 9 in. for the new series. Kennametal Inc., Dept. RLC, Latrobe, Pa.

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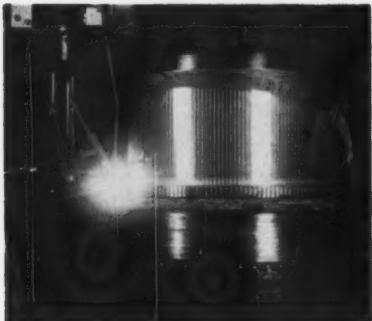
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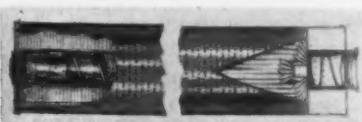
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Traction Motor Repair

Reliability of rebuilt traction motors for heavy diesel-electric locomotives is said to be increased through the use of Tungsten Inert Gas arc welding. This is a semi-automatic spot welding method which uses Tungsten for the electrode and inert gas to shield the molten weld puddle from atmospheric contamination. Used on traction motor commutators, it fuses copper to copper, yielding a strong, ductile joint, according to GE's Service Shops Department. Soldering is eliminated. *General Electric Co., Dept. RLC, Schenectady 5, N.Y.*



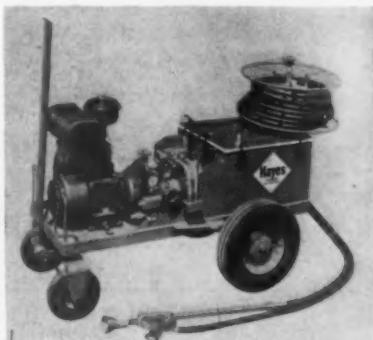
by specially developed adhesive to provide positive filtration with high flow. End caps are of 26-gage tin plate. An expanded 12-gage steel reinforcing spring is enclosed in the center plate of 28-gage cold-rolled steel. Hycar Spacer is at top of filter. Full-flow cageless or canister types are available in 5½- and 6½-in. diameters. *Superior Diesel Filter Co., Dept. RLC, 200 S. Michigan ave., Chicago 4.*



Discharge Gate

Rack-and-pinion operation of the "Power-Gearred" discharge gate for covered hopper cars is centered around a hypo-cyclic gear combined with an anchored pinion, free to

follow the eccentric crankshaft path but not free to rotate itself. This 6:1 reduction ratio enables an average man with a 5-ft bar to exert 19,000 lb of opening power at the power-gearred gate, compared to 6,500 lb at a direct-drive gate. *Wine Railway Appliances, Division of Unitcast Corp., 2237 Water Works Drive, Toledo 9, Ohio.*

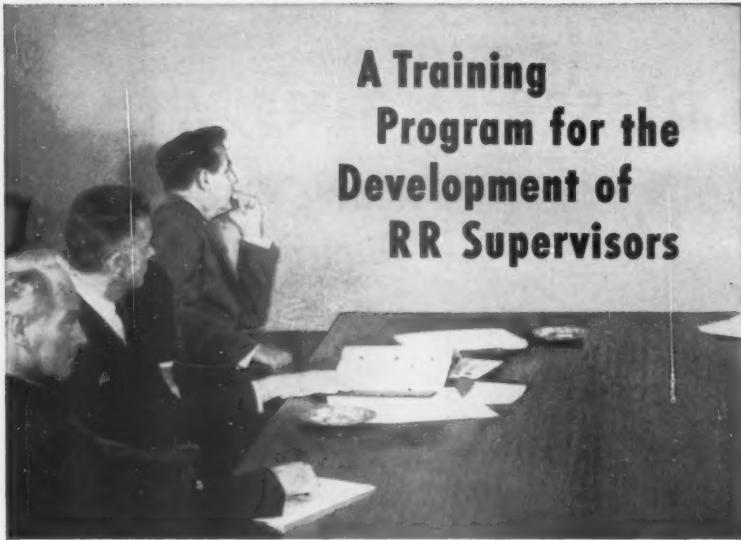


Power Sprayer

Cleaning of cars, locomotives, repair shops, or pits, it is said, is fast and efficient with the portable Hayes Jet 500 heavy-duty power sprayer, using only cold water with detergents and cleaning compounds of any type, liquid or soluble. Only one man is needed for operation of the sprayer which applies 10 gal of mixed spray material per

Paper Filter Cartridge

The pleated filter paper in the CP3 filter cartridge for diesel locomotives is corrugated. It is held in position to outer shell



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min at gage pressure of 500 lb psi, or 6 gal at 200 psi. It is capable of delivering 300 gal of spray solution with each full loading of the 12-gal concentrate tank, or can be used to spray as little as 50 gal. The gasoline engine is a 7-hp, 4-piston pump type. It weighs approximately 425 lb. Hayes Spray Gun Co., Dept. RLC, Pasadena, Calif.



Trailer Bridge Plate

Lightweight aluminum bridge plates are now available for piggyback cars. The new design weighs 85 lb as compared with the 160-lb weight of the conventional models. The welded aluminum assemblies are durable, do not rust, and will support all legal truck-trailer loads. One type has an abrasive treadplate surface. Another type which has performed satisfactorily for two years has a diamond treadplate surface. Aluminum Co. of America, Dept RLC, 1501 Alcoa Building, Pittsburgh 19.



Electric Toilet

Waste is reduced to inorganic ash in a matter of minutes with the Incinoret, an electrically operated toilet which has been successfully installed on diesel locomotives. Candor, a built-in, heat-activated catalyst, is used to stop odors. The unit is also suitable for work cars, trailer houses, and isolated work areas where water-flush systems freeze, or are difficult and expensive to install. Research Products Manufacturing Co., Dept. RLC, Box 35614, Dallas 35, Tex.

Supply Trade Notes



Thomas C. Ballou
ACF



Henry F. Dreyer
Humble Oil



W. H. Schomburg, Jr.
Dana

AMERICAN CAR & FOUNDRY DIV., ACF INDUSTRIES, INC.—*Thomas C. Ballou*, New York district sales manager, appointed manager of railway equipment sales. *Robert R. Curtis* appointed sales representative, St. Louis district, succeeding *Walter H. Pogue*, resigned.

AMERICAN STEEL FOUNDRIES.—*Walter Moryto* appointed mechanical assistant to the vice-president, Transportation Equipment Division. Mr. Moryto will continue also as manager of division's service engineering section. *Raymond C. Howell* appointed chief works engineer, Transportation Equipment Division. *J. Herbert Lund* named manager of railway sales, Hammond division.

DANA CORP..—*W. H. Schomburg, Jr.*, assistant general sales manager, appointed general sales manager. *John P. Henson*, sales manager, Universal Joint division, appointed assistant general sales manager.

VAPOR HEATING CORP..—Stockholders of Vapor Heating Corp. have approved a change in company's name to Vapor Corp.

HUMBLE OIL & REFINING CO..—*Henry F. Dreyer*, engineer, named manager of railroad sales, Esso Standard Region.

JOURNAPAK CORP..—*Magnus Metal Corp.* appointed national distributor in the U.S. *T-Z Railway Equipment Co.* will continue to handle selected accounts for Journapak.

AIR REDUCTION SALES CO..—*L. J. MacLennan, Jr.*, appointed assistant manager of distributor sales, midwestern region. Mr. MacLennan formerly assistant manager of distributor sales, Pittsburgh district.



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RAILWAY SERVICE & SUPPLY CORP.

—*A. T. Cox, Inc.*, Cleveland, appointed sales agent, Cleveland-Pittsburgh area.

SHELL OIL CO.—*Warren C. Landis* appointed manager of railroad sales, New York, succeeding *William B. Garthe*, who will assist Mr. Landis during a transitional period before assuming another position with the company. Mr. Landis was formerly industrial products manager at Baltimore, Md.

BUDD CO.—A dynamometer, using an electronic analog control and feedback system, has been developed and installed by the Budd Railway Division exclusively for railway brake research and quality control. The machine is said to be capable of simulating the most frequent starts and stops and severest grades encountered by any mainline passenger, freight, commuter, or rapid transit train.

GENERAL ELECTRIC CO.—GE will build a multi-million-dollar Apparatus Service Shop at Cleveland to handle overhaul and repair of locomotives, steam turbines and generators, transformers and industrial motors of all sizes. The 110,000-sq ft facility will include an inside-the-building railroad siding, 600-ton hydraulic press, 30,000-lb precision balancing machine, and one to 100-ton overhead crane coverage.

STONE FILTER CO.—*Obey N. Erlenmeyer* appointed director of sales.

SPARTON RAILWAY EQUIPMENT, DIVISION OF SPARTON CORP.—*Robert J. Passani* and *Dan Call* appointed eastern representatives. Mr. Passani will cover northeastern states from 500 Fifth ave., New York; Mr. Call, southeastern states from 8913 Briery ave., Richmond, Va.

MOTOR COILS MANUFACTURING CO.—*Walter F. Fauerbach* appointed vice-president, sales.

OBITUARY

DAVID R. VOGEL, 47, district sales manager, Morrison Railway Supply Corp., died Sept. 10 at his home in South Holland, Ill.

Letter to the Editor

Traction Gear Wear

TO THE EDITOR:

Mr. Taylor's article, "Doc Discusses Effects of Traction Gear Wear in the May issue of Railway Locomotives is the second I have noticed on this frequently neglected, yet critical and little understood, subject.

Congratulations to Mr. Taylor on his skillful presentation in a uniquely interesting and easily understood manner of what could be a difficult subject for your readers.

J. W. Teker

Manager, Engine Mfg. Engrg. & Operations, Locomotive & Car Equipment Dept., General Electric Co.

HELPS FROM MANUFACTURERS

LATHES. 8-page Bulletin 1218 describes features and construction of new Farrel-Betts heavy-duty 3-way bed lathes which range in capacities from 32 to 92 in. swing. Includes complete machine specifications. (Write: *Farrel-Birmingham Co., Consolidated Machine Tool Div.*, 565 Blossom Road, Rochester 10, N.Y.)

STEAM-DETERGENT CLEANING. "How to Get the Most out of Steam Cleaning with Oakite Specialized Detergents" lists six essential properties which detergents used in steam cleaning should have. Gives technical specifications of the Hurriclean steam-detergent gun and the Steam Pistol and a descriptive outline of materials now used in steam-detergent cleaning. (Write: *Oakite Products, Inc.*, 119 Rector St., New York 6.)

TRAINING FILM. 16 mm. color-and-sound motion picture, "How to Weld USS 'T-1' Steel," shows and explains importance of using right electrodes, right heat, and right procedures to insure sound welds in this constructional alloy steel. For group showings. Running time, 18 min. (Write: *U.S. Steel Corp.*, Dept. RLC, Room 6363, 525 William Penn Place, Pittsburgh 30, Pa.)

STEAM GENERATORS. Clayton steam generators for heating, for general shop service, for preheating cars, and for over-the-road service on diesel locomotives described in attractive "Transportation-Railroads" booklet. (Write: *Clayton Manufacturing Co.*, Dept. RLC, El Monte, Calif.)

ALL-PURPOSE CLEANER. Bulletin F-2834 on Aerowash liquid all-purpose cleaner gives directions for brush cleaning or automatic machine cleaning of diesel locomotive and passenger car exteriors, as well as brush or steam cleaning of interiors of locomotives and passenger, baggage and mail cars. (Write: *J. B. Ford Div., Wyandotte Chemicals Corp.*, Dept. RLC, Wyandotte, Mich.)

V-BAND COUPLINGS. 16-page booklet, (SDP-2), "Economics of the V-Band Coupling," gives specific cost comparisons between V-bands and other joining methods. (Write: *Marman Div., Aeroquip Corp.*, 11214 Exposition Blvd., Los Angeles, Calif.)

INDUSTRIAL FASTENERS. "Lebanon Plant Fasteners," Booklet 556, tells the story of Bethlehem Steel's Lebanon, Pa., plant and the fasteners made there. Booklet opens with a history of the plant; describes its manufacturing facilities, and details many of its products and processes. (Write: *Bethlehem Steel Co.*, Dept. RLC, Bethlehem, Pa.)

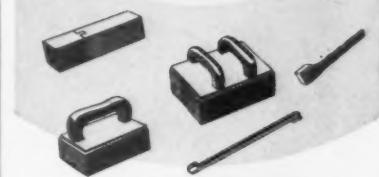
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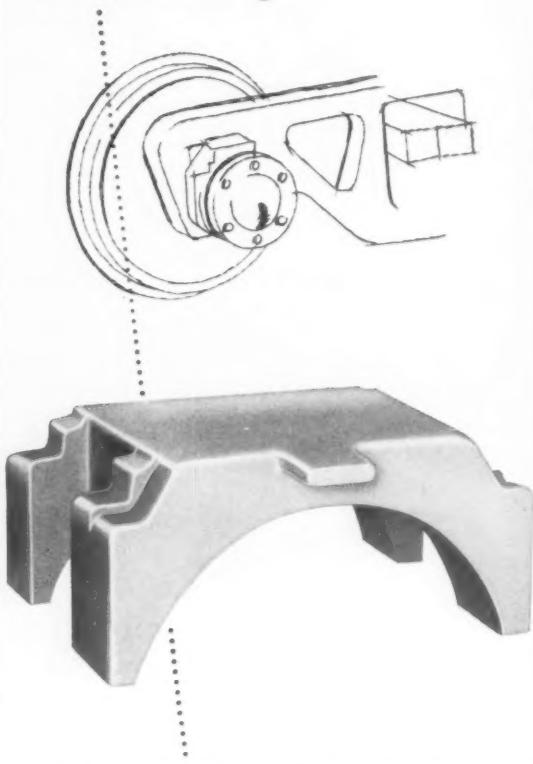
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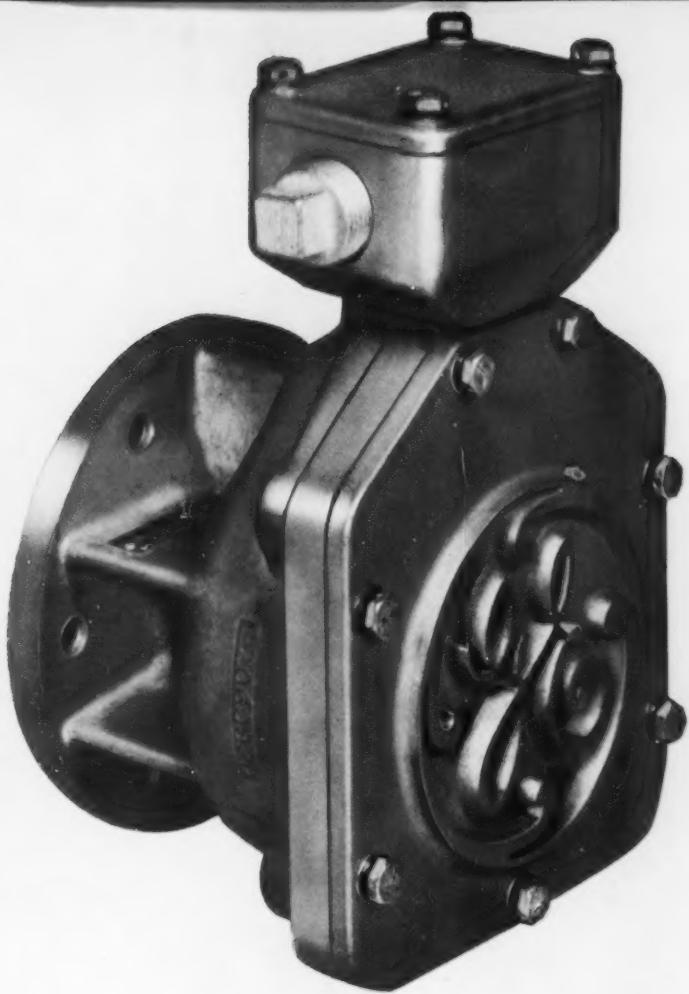
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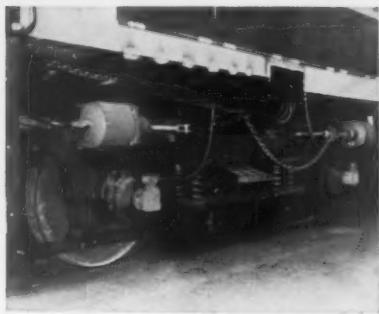
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Car Builders and Locomotive Cyclopedias and Dictionaries prior to 1935. Please state price, year, and condition of book. Write Box 11, RAILWAY LOCOMOTIVES & CARS, 30 Church Street, New York 7, New York.



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New
Adhesion Loss
Detection and
Correction
System**



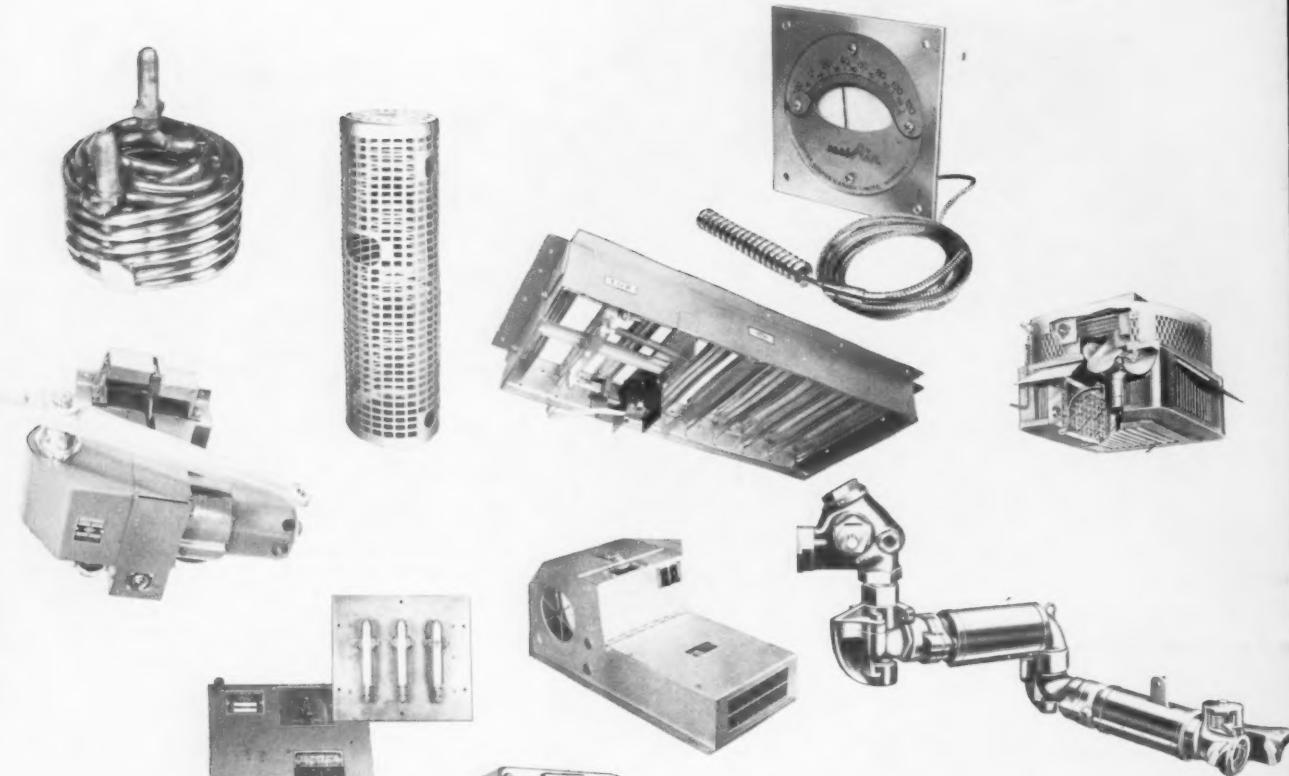
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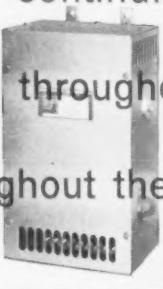
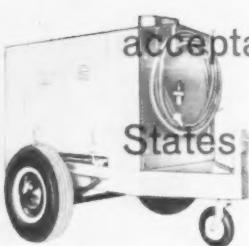
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